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Surface Tension:
Studio Glass and the Drawn Line

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Declaration of Originality

I, *Mel..Douglas..1.0/2/2020*..... [sign and date] hereby declare that the thesis here presented is the outcome of the research project undertaken during my candidacy, that I am the sole author unless otherwise indicated, and that I have fully documented the source of ideas, references, quotations and paraphrases attributable to other authors.

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Abstract

Surface Tension: Studio Glass and the Drawn Line is practice-led research that investigates how studio glass can be understood through the aesthetics of drawing. Focusing on contemporary and historical ideas of drawing and Anthropologist Tim Ingold's theories on line, the primary innovation is to conceptualise glass forms as drawings. What becomes apparent is that the medium of glass offers specific ways to both conceptualise and realise the drawn line. I argue this by submitting studio glass and drawing to a sustained analysis, through an interrogation of the spatial relationships between form and line. Organised into six chapters, each section of this thesis focuses on examining the utility of glass as a drawing material, and as a substrate for the drawn line. Drawing upon the work of Lazlo Maholy-Nagy, Susan Hefuna, Sol LeWitt, Fred Sandback and geometric theories this study aims to use line as a way to inform, define and enable three-dimensional space. Developing objects, in both two and three dimensions which spatially merge surface and drawing, where the form is not a support but a three-dimensional drawing itself.

Table of Contents

List of figures

Photography by the artist unless otherwise noted

Introduction

Chapter 1

Chapter 2

Fig. 2.5 Mel Douglas, *Studio exploration (additive trace) #5* 2015, kiln formed, coldworked glass and lead pencil, 15 x 15cm.

Fig. 2.6 Mel Douglas, *Studio exploration (additive trace) #6* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

Fig. 2.7 a–b Mel Douglas, *Studio exploration (additive trace) #7* 2015, blown, coldworked and enamelled glass, 15 x 10 x 10cm. and detail.

Fig. 2.8 Mel Douglas, *Studio exploration (additive trace) #8* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

Fig. 2.9 Mel Douglas, *Studio exploration (reductive trace, banded sections) #9* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

Fig. 2.10 Mel Douglas, *Studio exploration (incise) #10* 2015, kiln formed coldworked and stippled glass, 80 x 80cm.

Fig. 2.11 Mel Douglas, *Studio exploration (additive and reductive trace) #11* 2015, kiln formed, coldworked and engraved glass, 15 x 15cm.

Fig. 2.12 a–d Mel Douglas, *Studio exploration (additive and reductive trace) #12* 2015, kiln formed, coldworked and engraved glass, dimensions variable (group).

Fig. 2.13 a–c Mel Douglas, *Studio exploration (non-additive and non-reductive) #13* 2015, kiln formed and coldworked glass, 3 @ 15 x 15cm.

Fig. 2:14 a–d Mel Douglas, *Studio exploration (cuts cracks and creases) #24* 2015, kiln formed and coldworked glass, dimensions variable (group).

Chapter 3

Fig. 3.0 Liza Lou, *Continuous Mile* 2006–08, glass beads and threads, 120 x 230 x 230cm. Photo: The Corning Museum of Glass, Corning, NY, USA.

Fig. 3.1 Mel Douglas, *Studio exploration (transforming threads into traces) #14* 2015, glass, 25 x 25cm.

Fig. 3.2 Judith Scott, *Untitled* 1989, fibre and found objects, 94 x 86 x 12.7cm. © Creative GrowthArts Centre, Oakland , California, USA. Photo: Benjamin Blackwell.

Fig. 3.3 Mel Douglas, Detail of glass being trailed onto the surface of a bubble for *Studio exploration #15* in the hot shop, line dissolving surface, Canberra Glassworks. Photo: Louis Grant.

Fig. 3.4 Mel Douglas, *wove.wrap.weave* 2016, from the series *Mapping*, blown, coldworked and engraved glass, 30 x 65 x 30cm. Photo: David Paterson.

Fig. 3.5 Mel Douglas, *wove.wrap.weave* 2016 (detail), blown, coldworked and engraved glass, 30 x 65 x 30cm. Photo: David Paterson.

Chapter 4

Fig. 4.0 Tapio Wirkkala, *Leaf Platter* limited production 1951 and 1954, laminated birch, 3 x 24.5 x 48.5cm. Collection: National Gallery of Australia, Canberra.

Fig. 4.1 Jiyong Lee, *White Cuboid Segmentation, Option 2* 2013, cut, colour laminated, carved glass, 20 x 25 x 12cm. The Corning Museum of Glass, Corning, NY, USA.

Fig. 4.2 a–d Mel Douglas, *Studio exploration #16* 2015 ,(detail) kiln formed and coldworked glass, dimensions variable.

Fig. 4.3 Mel Douglas, *Studio exploration (engraving as interstices) #17* (detail), blown, coldworked and engraved glass, 40 x 40 x 40cm. Collection: Powerhouse Museum, Sydney.

Fig. 4.4 Carmen Herrera, *Amarillo Dos* 1971, steel and paint, 56 x 58 x 12cm.
Photo: Carmen Herrera.

Fig. 4.5 Stanislav Libensky and Jaroslava Brychtova, *Imprint of an Angel I and II* 1998–99, cast glass, 233.7 x 110.5 x 43.2cm. Collection: Museum of Fine Arts, Houston, USA.

Fig.4.6 John Pawson, *Plain Space* 2010, installation, Design Museum, London, UK.

Fig. 4.7 Mel Douglas, *Studio exploration (light lines) #18* 2015, kiln formed and coldworked glass, 15 x 15 x 5cm.

Chapter 5

Fig. 5.0 Joseph Albers, *Structural Constellation "To Ferdinand Hodler"* 1954, incised vinyl acetate resin on wood, 43.3 x 57.2cm. Collection: The Riklis Collection of McCrory Corporation, 985.1983, Museum of Modern Art, New York, USA.

Fig. 5.1 In elliptical space, the lines curve towards each other, with a positive constant curvature. In Euclidean space, the lines remain at a constant distance from one another even when extended into infinity. In hyperbolic geometry the lines curve away, increasing in distance as we move away from the third line.

Fig. 5.2 Wassily Kandinsky, *Lines* 1939, watercolour and tempera on black paper. 40 x 50cm.
Photo: Courtesy of the Jill Newhouse Gallery, New York, USA.

Fig. 5.3 Mel Douglas, *Studio exploration (spatial study) #18* 2015, kiln formed and coldworked glass, 15 x 15 x 5cm.

Fig. 5.4 Mel Douglas, *Studio exploration (spatial study) #19* 2015, kiln formed and coldworked glass, 45 x 45cm.

Fig. 5.5 Mel Douglas, *Studio exploration (bend flat surfaces into curves) #20* 2015, kiln formed and coldworked glass, 45 x 45 x 6cm.

Fig. 5.6 Lazlo Maholy-Nagy, *Space Modulator* 1939–45, oil and incised lines on Plexiglass, 88.6 x 93cm.
Collection: Solomon R. Guggenheim Founding Collection. Solomon R. Guggenheim Museum, New York, USA.

Fig. 5.7 Mel Douglas, *Studio exploration (light lines) #19* 2015, kiln formed and coldworked and engraved glass, 55 x 55cm.

Fig. 5.8 a–b Susan Hefuna, *Building* 2009, ink on tracing paper, nine part, 21.5 x 62.5cm. and detail.
Collection: Solomon R Guggenheim Museum, New York, USA.

Fig. 5.9 Sol LeWitt, *Wall Drawings #1085: Drawing Series—Composite, Part I–IV* 1968, graphite on wall, 481.3 x 774.7cm. Collection: Gift of Melva Bucksbaum and Raymond Learsy, Dia Art Foundation, New York, USA.

Fig. 5.10 Fred Sandback, *Untitled (Two-part construction)* 1996, ochre and beige acrylic yarn, overall dimensions vary with each installation. Collection: Gift of the Fred Sandback Estate, Dia Art Foundation, New York, USA.

Fig. 5.11 Studio image of studies, Jun Kaneko's studio.

Fig. 5.12 Works in progress, Jun Kaneko's studio.

Fig. 5.13 a Studio image, Jun Kaneko's studio.

Fig. 5.13 b Images of recent projects, Jun Kaneko's studio.

Fig. 5.14 Working image, glass drawings, Bullseye Residency. Photo: Lani McGregor.

Fig. 5.15 Working image, Bullseye Residency.

Fig. 5.16 Working on the casting floor, Bullseye Residency. Photo: Bullseye Glass Co., Portland, USA.

Fig. 5.17 Floor talk, Bullseye Residency.

Fig. 5.18 Working image, Bullseye Residency.

Fig. 5.19 Working image, Bullseye Residency.

Fig. 5.20 Studio exploration, Bullseye Residency.

Chapter 6

Fig. 6.0 Mel Douglas, collage of series *Mapping, Inscribing, Rendering, Highlighting, Transcribing* and *Tracing*. Photos: David Paterson.

Fig. 6.1 Mel Douglas, *Callow* 2016, blown, coldworked and engraved glass, 30 x 40 x 40cm. Photo: David Paterson.

Fig. 6.2 Mel Douglas, *wove.woven.weave* 2017, from the series *Mapping*, blown, coldworked and engraved glass, 30 x 120 x 40cm. Photo: David Paterson.

Fig. 6.3 Mel Douglas, *wove.woven.weave* 2017 (detail), blown, coldworked and engraved glass, 30 x 10 x 40cm. Photo: David Paterson.

Fig. 6.4 Mel Douglas, *Mid tone 1–7* 2018 (detail), blown, coldworked and engraved glass, 45 x 350 x 45cm. overall. Photo: David Paterson.

Fig. 6.5 Mel Douglas, *Mid tone 1–7* 2018, from the series *Mapping*, blown, coldworked and engraved glass, 45 x 350 x 45cm. overall. Photo: David Paterson.

Fig. 6.6 Mel Douglas, *Bifold* 2017, from the series *Inscribing*, kiln formed and coldworked and engraved glass, 58 x 65 x 6cm. Photo: David Paterson.

Fig. 6.7 Mel Douglas, *Bifold* 2017 (detail), kiln formed and coldworked and engraved glass, 58 x 65 x 6cm. Photo: David Paterson.

Fig. 6.8 Mel Douglas, *Hue, tint and shade* 2018, from the series *Inscribing*, kiln formed, coldworked and engraved glass, 3 @ 60 x 60 x 6cm. Photo: David Paterson.

Fig. 6.9 Mel Douglas, *Hue, tint and shade* 2018 (detail), kiln formed, coldworked and engraved glass, 3 @ 60 x 60 x 6cm. Photo: David Paterson.

Fig. 6.10 Mel Douglas, *Onyx* 2017, from the series *Rendering*, kiln formed, coldworked and engraved glass, 120 x 85 x 5cm. Photo: David Paterson.

Fig. 6.11 Mel Douglas, *Onyx* 2017 (detail), kiln formed, coldworked and engraved glass, 120 x 85 x 5cm. Photo: David Paterson.

Fig. 6.12 Mel Douglas, *Centrefold* 2018, from the series *Rendering*, kiln formed, coldworked and engraved glass, 85 x 85 x 8cm. Photo: David Paterson.

Fig. 6.13 Mel Douglas, *Two fold* 2018, from the series *Rendering*, kiln formed, coldworked and engraved glass, 2 @ 85 x 45 x 5cm. Photo: David Paterson.

Fig. 6.14 Mel Douglas, *Borderline* 2018, kiln formed, coldworked glass, 120 x 150cm. overall. Photo: David Paterson.

Fig. 6.15 Mel Douglas, *Studio exploration #21* 2016 (detail), kiln formed glass, 45 x 45cm.

Fig. 6.16 Mel Douglas, *Refracted* 2018, from the series *Highlighting*, kiln formed, coldworked glass, 50 x 150cm. overall. Photo: David Paterson.

Fig. 6.17 Mel Douglas, *Studio exploration #22* 2017, glass, 20 x 10cm.

Fig. 6.18 Mel Douglas, Working image *Studio exploration #23* 2017, glass Photo: Louis Grant.

Fig. 6.19 Mel Douglas, *Detach* 2018, from the series *Transcribing*, glass on paper, 55 x 65cm. Photo: David Paterson.

Fig. 6.20 Mel Douglas, *Tipping* 2018 (detail), from the series *Transcribing*, glass on paper, 45 x 45cm. Photo: David Paterson.

Fig. 6.21 Mel Douglas, *Shudder* 2019, from the series *Transcribing*, glass on paper, 55 x 65cm.
Photo: David Paterson.

Fig. 6.22 Mel Douglas, *Netting* 2018, from the series *Tracing*, glass line drawing, dimensions variable.

Fig. 6.23 Mel Douglas, *Tracing* 2018, from the series *Tracing*, glass line drawing, dimensions variable.

Fig. 6.24 Richard Long, *A line made by walking* 1967, silver gelatin print, 37.5 x 32.4 cm.
Collection: TATE Gallery, London, UK.

Fig. 6.25 Mel Douglas, *Scribing* 2019, from the series *Tracing*, glass line drawing, dimensions variable.

Conclusion

Fig. 7.0 Installation views, *Mel Douglas: Higher Research Degree: Season 2*, 2019, School of Art and Design Gallery, Australian National University, Canberra, ACT, Australia. Photo: David Paterson.

Section One—Surface Tension

Introduction

Surface Tension: Studio Glass and the Drawn Line is practice-led research that investigates how studio glass can be understood through the aesthetics of drawing. I began this investigation to test how studio glass could become a drawing, particularly as objects and drawings are often thought of as two separate entities. This direction of research has led me to find ways to interweave both glass and drawing through an interrogation of different types of line. The conventional use of line drawing is to represent two- or three-dimensional objects, either through graduations in shade, texture or shape. Whereas line used in glass is usually applied to the surface of objects after production, not as an integrated element within the work. However, in this practice-led research I have set out to explore the creative possibilities that exist between the two mediums in order to create new understandings of the relationship between surface and form through the use of line.

This practice-led research builds upon my professional career as an artist with over 20 years of professional international experience within the field of contemporary craft and design. With my expertise, skills and knowledge of contemporary studio glass I have extended the scholarship of practice-led research to position glass as a medium in the practice of drawing. Throughout my candidature, I have tested my speculative work through public exhibitions, a list of which is on pages 162–163 of this exegesis.

Within studio glass there has traditionally been a delineation between artists who work in two and three dimensions. In my practice I work across a range of methods, from hot glass, kiln forming and coldworking. It is through this research that my practice has expanded into multidisciplinary areas of printing and drawing. The outcomes of this can been seen in Chapter 6, through my final body of research.

Prior to the commencement of my research the focus of my practice was building surfaces through the application of engraved lines on glass objects. The lines applied to my surfaces created flat, textural fields. Towards the end of 2014, I began looking for new ways to integrate line and surface, I wanted to find ways to animate and subvert surfaces through line. I was seeking to find a connective purpose between my forms and their surfaces to explore space; I wanted the lines to be active and directive. Although working in the field of studio glass, I was interested in printmaking and drawing and while my practice used the drawn line, I had never positioned or thought about my work as 'drawing'.

In Chapter 4 I explain how my study of Tapio Wirkkala's *Leaf Platter* led me to consider how my practice could be viewed as a form of drawing. [Fig. 4.0] In this work of art, Wirkkala has used the grain of the wood and the lamination lines to build and reveal the leaf-like form. Looking at this method of construction I realised that the artist was using these visual elements to create a tension between the line and the three-dimensional form. Through this observation, I identified similarities in the way I used line to build forms using glass. Along with glass, 'line' has always been an integral element in my work. Through the use of line in glass objects, I have explored notions of movement, time and spatiality.

This discovery led me to want to further question and extend my knowledge of glass by researching and incorporating a deeper understanding of drawing. It led me to question how the two and three dimensionalities of glass could become something more than just a separation of ideas about its form and surface. Therefore, in this exegesis, I describe how I have made an important connection between my studio glass practice, and the practice of drawing. This connection has enabled me to consider and use the 'form' as more than just a substrate for drawing—rather as a three-dimensional drawing in itself. For example, I discuss how artists such as Richard Tuttle (Fig. 0.0) and Fred Sandback (whose drawings interrogate line and space)—have also informed my knowledge of drawing. [see Chapter 4] Through an examination of their work I have identified the potential for engaging with the material and technical specifics of glass practice via thinking of glass as a drawing medium.

I have also furthered my understanding of how drawing can be achieved by applying theories of line, drawing and geometry to the distinctive material quality of glass. By 'drawing' these distinct fields together, I explain how I have investigated new ways of working with the materiality of glass as line and new ways of expressing line through glass. By combining the unique qualities of the glass with the rich potential of mark making, I have developed techniques to consider how line can inform, define and enable an object as a drawing. Through testing and resolving new work in the studio, I have also considered how the transparency and opacity of glass as a drawing material can free line beyond a two-dimensional perspective. Experimenting with glass in this way has provided me with new types of line that move through the space of an object, into the substrate and back out into free space. Particular examples of how this was achieved are discussed in the series of work *Mapping* which is further described in Chapter 6.

My investigation has also been motivated by my need to extend the potential of thinking about glass within a conceptual framework. Until I began undertaking this PhD research, my work has been viewed primarily within the studio glass discipline. Through a critical examination of the potential for glass to be understood as drawing this research has led me to

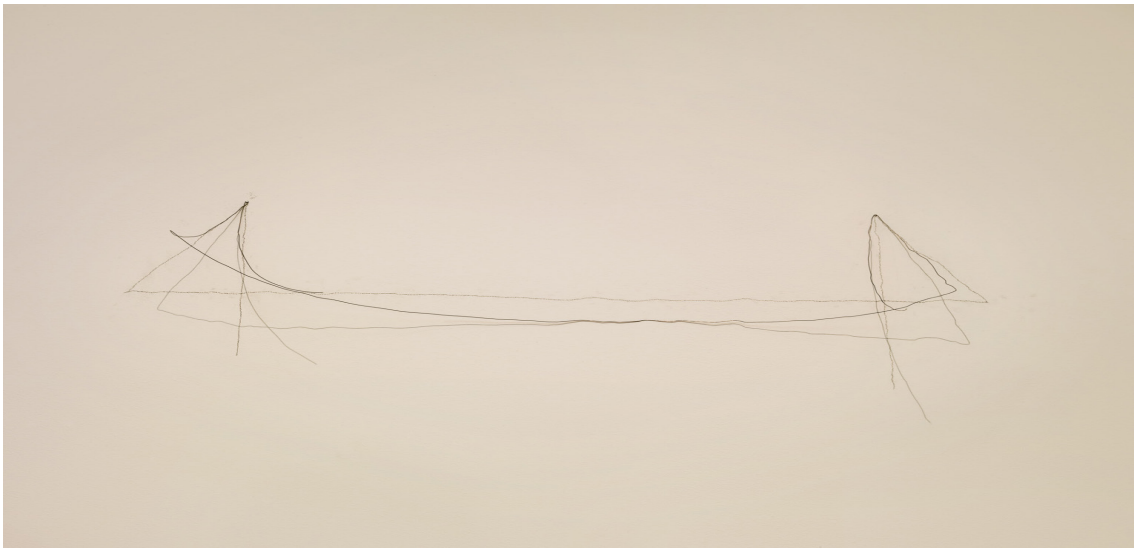

Fig. 0.0 Richard Tuttle, *42nd Wire piece* 1972, florist wire, nails and graphite, installation dimensions variable. From the collection of the artist © 2015 Richard Tuttle, courtesy of Pace Gallery, New York, USA.

Fig. 0.1 Harvey Littleton at the Toledo Workshop, June 1962. Photo: The Corning Museum of Glass, Corning, USA.

reconsider how my new work might be received outside of a studio glass perspective. Through my research I have taken an interdisciplinary approach to develop a body of research that looks beyond the disciplinary confines of one material. In doing so I have combined ideas and theories from the wider field of visual arts, anthropology and the sciences.

The modern movement of studio glass began in America in the 1960s and is still recognised within visual art and craft disciplines. Prior to this, glass practice and manufacture had been mainly restricted to industry, with some designers such as René Lalique and Emile Gallé working with factories to produce high quality objects. When a number of artists in the USA [such as Harvey Littleton and Martin Lipofsky] began to work with glass as a creative medium it created a significant shift between designer and maker. (Fig. 0.1)The studio glass movement began to be driven by artists who were both creative and technical, and smaller studios began to be established to foster this new way of working. While my practice has developed from this modern history of studio glass, I am also looking for a different kind of pathway as a contemporary practitioner. Just as craft theorist Glenn Adamson has observed, in the last fifteen years contemporary studio glass has begun to expand its horizons, focusing less on technique and more on the artistic expression of ideas.[1] Through this research, I too set out to enrich my practice with these new understandings and discoveries.

Stemming from the Latin *linea* for line the etymology of the word 'line' provided pivotal points for my research.[2] Linen is a textile thread—a line. From this single thread two-dimensional surfaces and three-dimensional forms can be made. This has similarities with how I have employed line as multiple strokes that are layered, and build, to form a surface. By using filaments or trails of glass I have explored building surface and form from a single line. Weaving with textile threads, like the act of drawing lines, overlaps, weaves and entwines, so that each mark becomes indistinguishable, thus building the singular into a field, a surface, or a form.

There is also a duality in the definition of line. In the *Oxford English Dictionary,* a line is defined as 'tracks or movement.'[3] This suggests a line can follow any path, taking any shape and it can follow or outline any surface as a gestural mark. On the contrary, when 'line' is translated into the Greek *kanon* it means 'measuring rod'—a tight, defined unit of measurement.[4] This contradiction in definitions opens 'line' up to be almost any kind of mark, offering a palette of line to delineate form.

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1 Glenn Adamson, 'The Downside of Success,' *American Craft Magazine*, February/ March 2012. URL: https://craftcouncil.org/magazine/article/downside-success

2 *Dictionary.com.* nd. 'Line (n.),' definition for line (unabridged). URL: https://www.dictionary.com/browse/line (accessed 1/7/2016).

3 *Oxford English Dictionary*, 'Line (n.),' definition for line. URL: https://www.dictionary.com/browse/line (accessed 1/7/2016). Now available at: https://www.lexico.com/en/definition/line

4 Robert K. Barnhart, ed., *Barnhart Dictionary of Etymology*, 1988, New York: H.W. Wilson Co.

This duality in the meaning, led me to consider the ways in which line can create visual tension. Line can mean both stop and go: a white line on a path shows us where we must walk, where we must stop and where we must not go beyond. On the contrary, looking out to the horizon line is a mark that goes on forever, it stretches to infinity. Using the opposing meanings attached to the concepts of line provides an opportunity to use line metaphorically.

For my final body of work for examination, *Surface Tension*, I use line as a way of segmenting and dividing surfaces. In this work I show how connections have been made between the mathematical definition of 'line' and my use of geometry and mathematics within my final research. I have been inspired by geometrical understandings of space and line, and have drawn on mathematical terminology to describe lines in space – for example, the locus of a point. It traces the shortest distance between two given points and then continues on indefinitely in either direction.[5] Such descriptions of lines which have no limits and that can continue forever has great resonance with my exploration of line and space in glass.

On the contrary an alternative definition describes line as 'a demarcation or boundary,'[6] this is an area that separates two planes, restricts movement and provides an end point. As discussed in my final chapter in more detail I used glass lines as a way to suggest movement and stillness, two opposing forces. I used a directional line and a junction or boundary to create distinct planes to animate a surface. The demarcation of these planes of lines becomes a boundary or a limit, faceting the surface and folding a flat surface into illusionary planes. (Fig. 0.2)

Exploring the multitude of definitions and the origin of the word 'line' underlined and uncovered many unexpected resonances, both conceptually and contextually within my research. It allowed me to contemplate how line can be used as both a visual tool and as a symbolic mode of communication. All of these notions of line have been investigated through my final body of research which brings these areas together to explore the connection between line and surface and space.

Central to understanding line in the context of an art practice are texts such as anthropologist Tim Ingold's theory on lines.[7] In his work Ingold examines the relationship of line and surface across a range of visual sources. The exhibition catalogue *On Line: Drawing through the*

5 H. M. Coxeter and L. Greitzer, *Geometry Revisited*, 1967. Washington, D.C.: The Mathematical Association of America. URL: http://www.aproged.pt/biblioteca/geometryrevisited_coxetergreitzer.pdf

6 *Macquarie Dictionary*, 'Line (n.),' definition no. 12. URL: https://www.macquariedictionary.com.au/features/word/search/?word=line&search_word_type=Dictionary (accessed 1/7/2016).

7 Tim Ingold, 'Drawing.' *Sensate: A Journal for Experiments in Critical Media Practice*, 2011. URL: http://sensatejournal.com/2011/03/tim-ingold-drawing-with-tim-ingold/ (accessed 31/6/2016); Ingold, *Lines: a brief history*, 2007, London and New York: Routledge; Ingold, 'Transformations of the line: Traces, Threads and Surfaces.' *Textiles: Cloth and Culture* 8, no 1: 10–35, 2015. URL: https://doi.org/10.2752/175183510X12580391270100; Ingold, 'Interview by Julia Yezbick and Aryo Danusiri', *Sensate: A Journal for Experiments in Critical Media Practice*, September 28 2010, Liege, Belgium. URL https://sensatejournal.com/tim-ingold-drawing-with-tim-ingold/

Fig. 0.2 Mel Douglas, Detail of segmented dividing engraved line on glass 2016, kiln formed, coldworked and engraved glass, 25 x 35 x 5cm. Photo: David Paterson.

Twentieth Century,[8] a comprehensive exhibition focused on key developments in drawing over the past 100 years, has also been useful in providing key examples of work which explore diverse and varied use of line and connections to surface. Other influential writings were John Berger's *Berger on Drawing*[9] which is a compilation of essays exploring how artists engage with the activity of drawing. *The Drawing Book,*[10] by art historian Charles Darwent and curators Kate Macfarlane and Katherine Stout, has also informed my understanding of the versatility and immediacy of drawing through the work of artists, architects, sculptors, scientists, filmmakers and thinkers of all descriptions.

As a starting point I used Ingold's notions of line as threads, traces or cuts/cracks.[11] Ingold's cross–disciplinary methodology examines materials from a range of visual sources to locate the varying relationships between categories of line and surface. Ingold's comparative methodology poses the simple question: 'For there to be lines, do there have to be surfaces, or can line exist without surfaces at all?'[12] Essentially, he is asking what are lines and what do they do. I used this as an overarching question for my initial explorations.

My research examines established and emerging studio methodologies in glass and drawing, supported by contemporary theory and writing on the concepts of line. I found a gap in knowledge in the practice of contemporary drawing in the context of studio glass, and my research question is based on addressing this gap through my own practice. In the studio my methodologies have been focussed on investigating the medium of glass as a practice of drawing. In this practice-led research I have tested how the relationship between drawing and glass can be understood conceptually through the creation of a body of new work supported by theoretical and contextual findings.

My practice-led theoretical research proposes new categories of taxonomy in drawing with glass in which concepts of dimension, notation, physiology and improvisation are understood as key components in the theory and practice of drawing. This is examined in relation to glass as both a subject of drawing and as a material process. Identification and reference to contemporary issues in drawing come from a variety of sources, as noted previously, along with contact with specific exhibitions and attendance at related events and conferences.

Through practice-led research I have focused on the outcomes of practice in the context of Linda Candy's argument that artists use practice-led research, 'as an original investigation in

8 Cornelia H. Butler, *On Line: Drawing Through the Twentieth Century*, 2010, New York: Museum of Modern Art. URL: http://www.moma.org/interactives/exhibitions/2010/online/ (accessed 1/8/2015).
9 John Berger, *Berger on Drawing*, 2005, Ireland: Occasional Press.
10 Charles Darwent, Kate Macfarlane and Katherine Stout. Tania Kovats, ed. *The Drawing Book, A survey of drawing: the primary means of expression*, 2007, London: Black Dog Publishing.
11 Ingold, *Lines: a brief history*.
12 Ingold, *Lines: a brief history*, p88

order to gain new knowledge partly by means of practice and the outcome of that practice.'[13] My investigation in the studio, tested the relationship between drawing and glass and followed the idea that this research, '...is concerned with the nature of practice and leads to new knowledge that has operational significance.'[14] I resolve my investigation through the creation of a substantial and original body of new work.

During this practice-led research I worked within the facilities of the Glass Workshop, Printmedia & Drawing, and the Textiles Workshop at the School of Art and Design at the ANU. Through fieldwork, I extended this research at the Bullseye Factory, Portland, Oregon USA. I combined these different disciplinary facilities to extend my knowledge and skills exploring various techniques of drawing with glass.

Research questions and chapter synopsis

Though my research I have identified three main threads of inquiry. *Section One—Surface Tension*, outlines my material investigations. This section is divided into two categories: the first tests the capabilities and parameters of glass lines in relation to Ingold's taxonomy; and the second investigates the new types of glass lines which sit outside, and build upon, Ingold's taxonomy. *Section Two—Line Extension*, outlines my field studies. This comprised a study of specific works by contemporary artists, attending a contemporary craft conference and a focused practice-led residency. The field studies informed my studio research in relation to the ability of line to subvert, create and articulate space, essentially putting the lines to use to move into space. *Section Three—Confluence of Line and Surface*, presents my conclusions about how glass can be used in distinctive ways to explore the relationship of line to three-dimensional space and surface.

My research was framed by the following question: how can glass be used in distinctive ways to explore the relationship of line to three-dimensional space and surfaces?

This question was underpinned by the following sub-questions. Firstly, I determined the conventions of drawing in relation to object-based practice, specifically within studio glass. Next, the key developments in the late 20th century, and contemporary drawing, were considered to provide a lens through which to reconsider the formal and spatial qualities of my glass practice. I then experimented with how the physicality of the drawn line in, or on, glass, could extend the presence and experience of drawing. My research then looked at how a drawn line could function to define or express an object or space and how I could use this in relation to my practice in studio glass. Finally, I investigated how a drawn line can become an object.

13 Candy,L.(2006).*Practice based research :A guide*. CCS Report 2006-V1. https://www.dropbox.com/s/joi97rubw7em1wg/PBR%20Guide-1.1-2006.pdf

14 Candy,L.(2006).*Practice based research: A guide*. CCS Report 2006-V1. https://www.dropbox.com/s/joi97rubw7em1wg/PBR%20Guide-1.1-2006.pdf

Chapters 1–6 detail how these questions were addressed and answered through the outcomes of my research.

Section One—Surface Tension, Chapter 1: Mapping line outlines my initial research to create a visual map and taxonomy of line. This study developed in the form of a collaged map of line, which I aptly named *Line Map*. (Fig. 1.0) Two central references for the development of *Line Map* were: Ingold's 'Transformations of the line'[15] which provided the system of classification, along with the catalogue, *On Line*,[16] which highlighted key works of art that challenged the traditional concepts of drawing. My *Line Map* clarified each of Ingold's categories, expanded my understanding of what could be constituted as drawing, along with identifying gaps in the classification. These classifications were supported through examples from the field of drawing and studio glass.

Chapter 2: Drawing a line tests the parameters of glass lines both technically and theoretically and asks the question: what are lines and what do they do? Building on my *Line Map* and the analysis of the examples from Chapter 1, this chapter uses Ingold's cross-disciplinary categories of line to develop and test the agency and utility of glass lines.

In *Chapter 3: Line and surface* I discuss the relationship between line and surface has long been a preoccupation in my studio practice. While navigating through Ingold's taxonomy of line, along with my *Line Map*, I was continually observing the relationship between the two. Once Ingold had finished laying out his categories of line, he then discussed the relationship of line and surface. This chapter investigates the connection between line and surface by exploring the notion that 'threads' and 'traces' can transform into alternative classifications of line when drawn together. This chapter also scrutinises how the materiality and distinctive qualities of glass as a drawing material led me to discover new relationships of line and surface.

Chapter 4: Lines beyond the boundary introduces lines beyond the boundary—categories which sit outside Ingold's current classification. I outline how my initial material investigations considered new categories of line which build upon Ingold's taxonomy, and how these new lines stand alone as different ways of using glass line to explore space and surface. The three new categories of lines are: line as structure, line as space and light lines. These new categories are supported by examples of works and by my studio investigations .

Section Two—Line Extension, Chapter 5: Linear perspective discusses my field work, what I did, what I discovered and what I learnt. My research in the field culminated in both

15 Ingold, 'Transformations of the line: Traces, Threads and Surfaces.' *Textiles: Cloth and Culture* 8, no 1: 10–35, 2015.

16 Cornelia H. Butler, *On Line: Drawing Through the Twentieth Century*, 2010.

theoretical enquiry as well as a focused practice-led residency at the Bullseye Glass Factory, Portland, USA. It charts my research travels across the United States of America, providing an opportunity to view collections, exhibitions, visit artists' studios, attend an international craft conference and a chance to experiment with new ideas and ways of working.

Section Three: Confluence of Line and Surface, Chapter 6: Configuring new space ties together all aspects of my studio research and through my final work I show how my research informed this body of work. This chapter considers the materiality of glass in relation to the characteristics of drawing. The resulting body of work illustrates how these ideas sit in contrast to conventional approaches in studio glass. It introduces my own taxonomic system of categorisation of line. This is organised into six streams of investigation—Mapping, Inscribing, Rendering, Highlighting, Transcribing and Tracing. Each of these groupings explored alternative techniques to draw with or on glass. I also describe the methodologies and processes of my research outcomes and show how I have extended and challenged my existing studio practice, along with broadening the field of knowledge framing contemporary studio glass.

I conclude the exegesis by describing my findings through practice-led research and creating a new body of work for examination. I summarise my experiences of undertaking interdisciplinary enquiry by addressing how I've approached answering my main research question—how glass can be used in distinctive ways to explore the relationship of line to three-dimensional space and surfaces.

Chapter 1: Mapping line

Line has always been an integral element in my work, as well as a fundamental constituent of the drawing vernacular, line therefore was the necessary place for my research to begin. The following poem alludes to the diversity of associations that come to mind when we contemplate what line is or could be:

> *Line*
> Surface engraved with a narrow stroke, path
> imagined between two points. Of singular thickness,
> a glib remark, a fragment, an unfinished phrase.
> It is any one edge of a shape and its contours
> in entirety. Melody arranged, a recitation,
> the ways horizons are formed. Think of leveling, snaring, the body's disposition
> (both in movement
> & repose). It has to do with palms and creases,
> with rope wound tight on someone's hand, things resembling drawn marks: a
> suture or a mountain ridge, an incision, this width of light. A razor blade
> at a mirror, tapping out a dose, or the churn
> of conveyor belts, the scoured, idling machines. A conduit, a boundary, an
> exacting
> course of thought. And here, the tautness
> of tent stakes, earth shovelled, the depth of a trench.[17]

In this chapter I follow where my research began. To broaden my knowledge of the use of lines, I started by reading Tim Ingold's *Lines: a brief history*.[18] In this book Ingold has created a theoretical model that explores lines with an anthropological perspective. He creates a taxonomy of line, which interconnects and weaves lines to show the relationship between people and things. Ingold argues people and things, if they are mapped out, can be the sum of interconnected lines. For Ingold to study 'things and people is to study the lines they are made of.'[19] I became particularly interested in how Ingold describes lines and their relationships to surfaces in relation to my own investigation in the surface and structure of glass objects. Surfaces are not simply a 'taken-for-granted backdrop.'[20]

17 Matt Donovan, nd. 'Line.' *around center: poems and photography*. URL: http://aroundcenter.org/poetry.html (accessed 23/5/2018).
18 Ingold, *Lines a brief history.*
19 Ingold, *Lines a brief history*, p5.
20 Ingold, *Lines a brief history,* p39.


CHRISTOPHER WILMARTH

Fig. 1.0 a Mel Douglas, *Line Map* 2015, collaged paper, 210 x 450cm.

Ingold's 'taxonomy of line' has been important for me in order to develop a broad visual map of line. The *Line Map* I compiled started as an exercise solely focused on the classification of line and as a way for me to establish what line was. Through this classification I gained a thorough understanding of Ingold's classifications, which have two primary terms: threads, traces, and three sub-categories: cuts, cracks and creases.[21] For example, Ingold identifies threads as having a surface whereas traces are any enduring mark left in a solid surface. Ingold specifies a thread can be 'fashioned in one way or another by human hands.'[22] All threads have surfaces yet are not drawn on surfaces. Some common examples are: fishing net, a ball of string or a spider's web. Whereas traces are any enduring mark left in a solid surface. Traces can be additive or reductive, or neither, for examples paths worn into grass.

In the *Line Map* I considered how to understand these terms and sub-categories by studying works of art which reflect different types or uses of line. I have studied works of art, mostly examples from 20th and 21st century drawing, alongside examples from studio glass. I catagorised these images according to Ingold's taxonomy of line: threads, traces, cuts, cracks and creases. Information gathered from *Line Map* was then used to conduct a cross-comparative study of line.

The *Line Map* clarified each of Ingold's categories, expanded my understanding of what could be constituted as drawing and provided a means to position studio glass alongside drawing practices. To make further classifications two central references were Ingold's article 'Transformations of the line.'[23] which provided a system of classifications. and the catalogue *On Line*,[24] which helped me highlight key works of art that challenged the traditional concepts of drawing. My *Line Map* was also informed by books such as Berger's *Berger on Drawing.*[25] and Darwent, Macfarlane and Stout's, *The Drawing Book*.[26] I gathered images of studio glass from resources such as: *New Glass Review*,[27] Tina Oldknow's *Voices of Contemporary Glass: The Heineman collection*[28] and *Glass Today: Contemporary International Glass* by Jennifer Opie.[29]

My *Line Map* (Fig. 1.0 a–c) set out to investigate three key questions: What are lines, what are the conventions of drawing in relation to object-based practice, specifically within studio glass, and how can key developments in the late 20th century and contemporary drawing

21 Ingold, *Lines a brief history,* pp41–50.
22 Ingold, *Lines a brief history,* p14.
23 Ingold, 'Transformations of the line: Traces, Threads and Surfaces.'
24 Cornelia H. Butler, *On Line: Drawing Through the Twentieth Century*, 2010.
25 Berger, *Berger on Drawing.*
26 Charles Darwent, Kate Macfarlane and Katherine Stout. Tania Kovats, ed. *The Drawing Book, A survey of drawing: the primary means of expression*, 2007.
27 *New Glass Review,* New York: The Corning Museum of Glass.
28 Tina Oldknow, *Voices of contemporary glass : the Heineman collection*, c.2009, New York: Corning Museum of Glass in association with Hudson Hills Press.
29 Jennifer Hawkins, Opie, *Glass Today: Contemporary International Glass*, 2004, London: Victoria & Albert Museum and New York: Harry N. Abrams.

Fig. 1.0 b–c Mel Douglas, *Line Map* 2015, (details) collaged paper, 210 x 450cm.

provide a lens through which to reconsider the formal and spatial qualities of my glass practice.

I adopted an archaeological methodology to compile my *Line Map*. I used Ingold's taxonomy as a tool for defining and classifying groups of works of art, according to the type of line used. My process began with the collection and collation of images of works of art, from all mediums including glass, which use line as a primary means for mark making. Images were drawn from a range of sources including books, articles, exhibition catalogues and various online resources. Once collected, each image was catagorised according to Ingold's taxonomy. By visualising line, I was able to distinguish the vast range of material qualities in which line can be expressed, from a fine wire line to a trough line in the earth. The map provided me with a broad range of possibilities of what line can be, from a thread running from two points, to a track left by movement. By putting Ingold's classes of lines to work in a multitude of contexts, my *Line Map* further identified where glass, as a line making material was clustered and drew attention to the categories where there were no examples. It revealed areas of line making which had been explored within the wider field of the visual arts but where studio glass had not. My *Line Map* also identified areas within Ingold's classification where there were gaps and overlaps, where there needed to be additional classifications. These discoveries are discussed in more detail later in Chapter 4.

The collage of references became my north star, guiding me through, tracing the evolution of drawing during the 20th century. They introduced me to artists such as Lucio Fontana, whose work challenged the traditional concepts of drawing and the relationship of drawing and space. I was able to map and trace how artists have developed line in two-and three-dimensional space, relational, figurative, real and discursive space. The resources also identified and explored the move away from paper as the primary support material for drawing. These developments were fundamental changes that occurred within the discipline of drawing, a time when artists began to explore line outside the confounds of paper and into real space, engaging with the discipline to explore gesture and form. An example of this is Australian artist Bronwyn Oliver's *Comet* (1991) (Fig. 1.1), a wire drawing, which sits independently from the wall, into free space. This work is discussed in more detail later in this chapter.

The process of classification directed me to consider the history of drawing as a tool to gain a comprehensive understanding of the use of line within the wider field of the visual arts. It expanded my definition of what line is, or can be, directing me to see how lines are part of our everyday environment. It showed me how lines can be physical or metaphorical, permanent or ephemeral, in writing, in landscape and in the traces left behind.

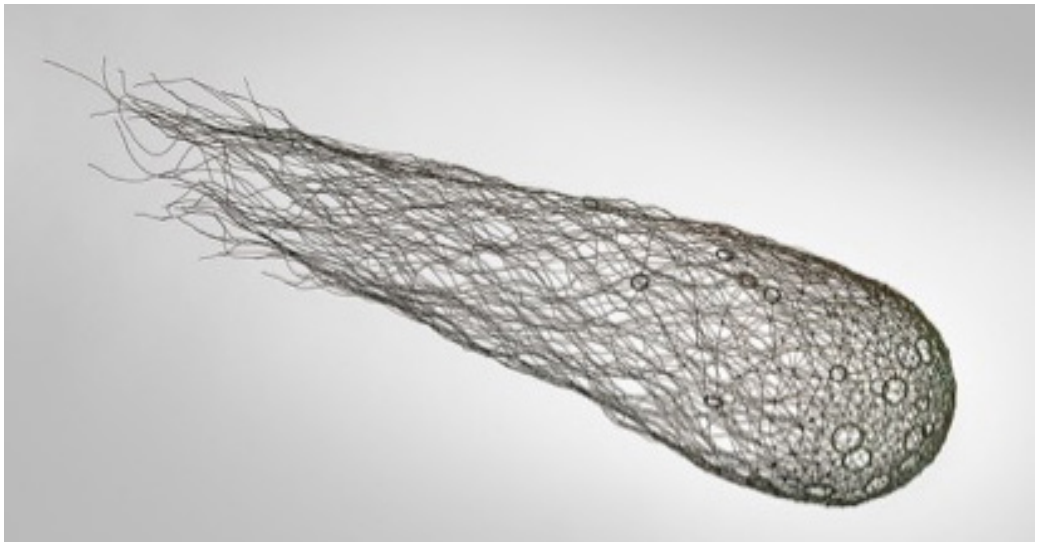
Line Map was also a way in which I was able to visually explore how other artists within studio glass have used line within their practices. By positioning glass lines within Ingold's categories, I identified areas where glass had not been used previously. By seeing the gaps alongside how these categories had been used within the field of drawing, I saw the potential for applying knowledge and techniques from drawing as a means to explore this using glass as a line making tool. *Line Map* identified how an individual mark or line can be considered as evidence of gesture (trace), erasure or removal (trace/cutting), or additions or accretions (trace, thread). These are all categories that Ingold introduces in his article . These categories led me to consider and explore through my material tests (which are discussed in Chapter 2) the connection of glass processes to time, the hand and body, the creation of surface and as a means to explore and map a three-dimensional form and space. In the following sections I outline Ingold's categories and discuss some of the key works from my *Line Map*.

Some works from my *Line Map* were of particular importance in my early research. These works were useful for varying reasons, some for the material qualities of line, some for the construction method used and others for the intention of the line. One aspect they all had in common was providing cues, small glimpses of new possibilities or ways of using glass as a line making medium.

The first two works *Comet* (1991) by Bronwyn Oliver and American artist Toots Zynsky's *Davvero* (2014) sit in Ingold's category of 'line as thread', which is described as 'a filament of some kind, which may be entangled with other threads or suspended between points in a three-dimensional space.'[30] Both Oliver and Zynsky use line as thread to explore the relationship of line, surface and space.

Comet by Oliver uses fine wires of copper, intricately and painstakingly entwined and suspended between two points. By manipulating the individual lines, intertwining them, the object becomes an identifiable form. From a distance the object looks like a pencil drawing tracing the outer three-dimensional surface of a comet. On closer inspection, the wire threads give the object purpose and movement through the change in the space between each thread. The whimsical more chaotic threads at the back end suggest the speed and distance at which the object has travelled. *Comet* is mounted on the wall, suspended between two points in space, slightly angled downwards towards the earth. Each thread is directed towards its final destination. Oliver's use of wire as a drawing material sees the fusing of drawing and sculpture. The drawing material (wire) is entirely linear, chosen for its malleability, linearity and sharpness. Beyond the tangible physical presence of this three-dimensional drawing, secondary lines become evident. Following the wire line drawing, a shadow is cast across

30 Ingold, *Lines: a brief history*, p41



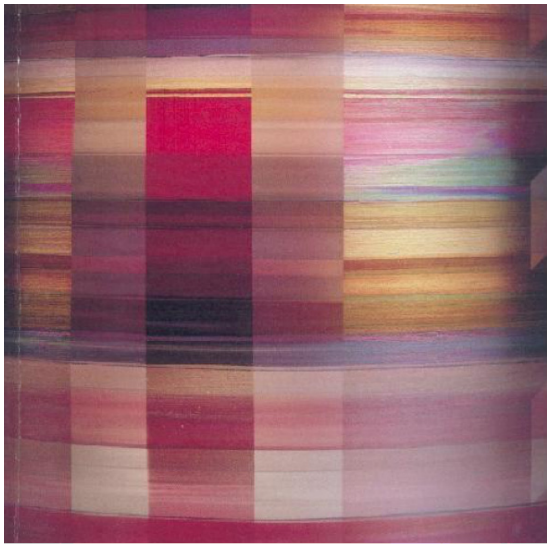


Fig. 1.1 Bronwyn Oliver, *Comet* 1991, copper wire, 25 x 99 x 25 cm. Collection: National Gallery of Australia, Canberra.

Fig. 1.2 Toots Zynsky, *Davvero* 2014, filet du verre (glass threads), 22 x 31 x 20cm. Heller Gallery, New York, NY, USA. http://www.hellergallery.com/toots-zynsky.

Fig. 1.3 Isgard Moje-Wohlgemuth, *Vessel* 1985 (detail), enamel on glass, 12 x 6 x 6cm. Focke Museum Selbstverlag, Bremen, Germany.

the wall describing its own linear configuration. This three-dimensional drawing is thereby grounded to the wall, through the connection between object and shadow.

There were two particularly notable ideas I derived from observing this object. First, this was a line drawing which sat freely in space, through the knitting of the wire, threads became a new surface. *Comet* is a three-dimensional line drawing which did not rely on a substrate. It was line and surface combined. This prompted a new way of thinking about the connection of the two within my own practice. Second, the shadow-as-line did not seem to fall into any of Ingold's categories, so I added it to my list of new lines.

Zynsky's *Davvero* (2014) (Fig. 1.2) also falls into Ingold's classification of line-as-thread. In the early 1980s Zynsky developed a method using fine glass filaments to build form called *filet de verre*. This method involves layering glass threads that are then fused and hot-formed inside a kiln. Zynsky's method requires her to heat a large mass of glass, allowing it to become molten and viscous, letting it run out of the bottom of a kiln, then using heat and gravity to stretch the glass into super fine strands. The strands are as thin as fine cotton, flexible but also very brittle. She organises the threads into colour groups and lays out and overlays the strands, building flat mats of glass threads.

Once she has the desired thickness, for durability and stability, she uses heat and gravity to form the flat mass into a sculptural form. The lines of glass thread, stagger and transition between colours, directing your eye and the light in continuous trails along the surface of her work. Zynsky's lines organically fold and curl, softly cupping the form undulating the lip of the vessel inward. Her three-dimensional line drawing is in constant motion; the strand of linear colours direct the movement, capturing every shift in the plane. The way Zynsky explores Ingold's category of line-as-thread opened up scores of new possibilities for using glass as a drawing material, either on a flat surface or on the surface of three-dimensional glass substrate. Her methods opened new ways to transform larger pieces of glass into fine filaments, which then had the flexibility to be entwined, entangled and woven together to build a surface.

Ingold's second category, traces, are those which he describes as 'any enduring mark left on a surface by a continuous movement.'[31] These were sub-divided into two streams 'additive' or 'reductive'. Additive traces are those that are made by applying material onto a surface, for example charcoal on paper. An additive trace is any material that leaves a residue or part of a material on a substrate. Most drawings fall in to this category. Isgard Moje-Wohlgemuth's *Vessel* (1985) (Fig. 1.4) shows line as an additive trace. Using the grid as way of ordering line across surface, her lines cross and connect into a web building new layers of surface, which overlay and entangle into new interconnected spaces.

31 Ingold, *Lines: a brief history*, p43

Vessel is a contemporary example of enamelling as an additive trace, illustrates how Moje-Wohlgemuth meticulously paints, and over paints, layers of metallic shimmering enamels in a grid like pattern to build a multi-dimensional surface. Her additive traces resemble woven textiles, her lines weave in and out of the surface of the glass. Her choice of palette adds to this sense of movement as the colours push and pull against one another, resulting in what looks like an undulating surface. The semi-translucent traces look like fine sheaths of silk wrapped around the surface. These traces veil the substrate, the linear bands move in and out of one another. The layers of painting and over painting, lines over lines, start to build new planes. As the grid structure is constructed a new space begins to develop, the layers start to create a three-dimensional volume.

Choreographer Anna Teresa de Keersmaeker, often uses the grid as a basic structure in her performances. She noted:

> [the grid]...starts with a point, from which a line is drawn, from which a square is traced, and more squares are traced until you obtain a grid which you posit several spirals – all drawn from the golden sections proportions. The choreography anchors itself on the focal points of these elements in a very rigorous way depending on the attitude towards the grid; both with reverence or with an urge from erasure, in other words forgetting it and returning to it. The grid is a kind of home which makes simultaneous, complex spatial organisations possible with each dancer moving as a point in space...As the grids are superimposed, they are continuously shifted around a fixed focal point.[32]

After reading this passage I drew similarities to Moje-Wohlgemuth's brush, which just like the dancers, moved in and out of ordered space. Becoming the moving points in space, weaving in and out of one another, gliding over the top of previously laid lines, concealing them, adding to them, and building new spaces, following the choreography but also moving freely within space. Looking closely at the work of Moje-Wohlgemuth's highlighted many important characteristics of glass. The layering of transparent and translucent lines to build a multi-dimensional surface led me to explore the notion that additive traces could be fleeting and impermanent while others are enduring marks left as a trace on the surface of glass. These ways of using line making within my practice are discussed in the next chapter through examples of my own material explorations.

In contrast to the additive traces, reductive traces are those 'formed by removal of material' of the substrate.[33] This type of mark making is one that I have used in my own practice as a

32 Butler, 'Anne Teresa de Keersmaeker in conversation with the author,' *On line*, pp89–90
33 Ingold, *Lines: a brief history,* p43

primary means of exploring the relationship of surface and form. I use engraving to mark make, which is the removal of material to create lines on the surface of the glass. Up until this point I had seen this mode of line making as simply marking a substrate. However, by observing how reductive traces have been used to explore the relationship of line and surface across a variety of different media, I started see how reductive lines alter a surface. My *Line Map* exposed how reductive lines can reveal intrinsic characteristics of a substrate or a medium. The following examples illustrate the potential for reductive lines and their relationship to surfaces.

The use of reductive trace lines is exquisitely illustrated in the work of French artist Pascal Oudet. As a key example, *Vortex* (2015) (Fig. 1.4) is carved from a single piece of wood, turned using a lathe and chisel. Oudet turns and shapes the object until its walls become paper thin, almost translucent. The object is blasted with a mixture of air and sand (sandblasting), which erodes and removes the softer areas of the wood grain. This removal of material reveals the structure of the wood resulting in a lace-like surface, leaving reductive traces. Through the removal of material Oudet's object becomes a three-dimensional drawing in space. After the softer areas of wood are blasted away, he is left with a matrix of lines that intersect like a grid to form the skeleton of the vessel. Through the removal process, this multi-dimensional line drawing reveals the inner structure of the wood, an organic grid of translucent wooden lines, forming the outer surface of a vessel.

Having analysed Oudet's application of reductive lines, I started to reconsider what it means to engrave the surface of glass. Not only am I inscribing lines into the surface, the space left between each line also become a new linear stroke. Through the act of removing material from the surface of a substrate, I am dividing the surface into two layers. Reductive traces that cover the entire surface of a substrate have the ability to transform a surface. By covering an entire surface, you are in fact creating a new surface. I noticed that reductive traces reveal and expose parts of a substrate that usually remain unseen or unexploited. In the case of reductive engraved lines on glass, it made me value and understand the simplicity in rupturing or disrupting a glass surface—and how that disturbance becomes a vehicle to hold light. The fractured edges of the removed line become small lenses that reflect light. The exposed lines removed from the surface not only reveal the inner make-up of the material, they also identify a new element, the original substrate's surface, which in contrast starts to become its own linear element that sits against the course, rough, reductive line. (Fig. 1.5)

It became clear through the exploration of reductive lines in glass that it has distinct characteristics opposed to other line making materials. Most reductive lines leave a line that is very similar to the surface. Usually the only difference is a change in the dimensions of the

Fig. 1.4 Pascal Oudet, *Vortex* 2015, sandblasted and carved wood, 22cm x 15 x 15cm; 16 x 13 x 13cm. Photo courtesy Pascal Oudet.

surface, you are left with a low relief. As glass is very hard, to remove it you need a strong, coarse tool. Most tools used for the removal of glass are made from rough diamonds. To remove material, you have to grind away at the surface, this not only gives you a means for mark making, it also changes the texture of the surface of the removed line. This provides contrast and also highlights the new role of the surface, where the negative space of the surface becomes its own linear configuration.

This led me to contemplate what the result of combining both additive and reductive traces would be, and how this combination would change or impact the surface of the substrate. Louise Bourgeois' drawing *Untitled* (2002) (Fig. 1.6) uses a combination of additive and reductive traces as a means for line making. Combining both marks allowed Bourgeois to add an additional spatial element to surfaces, almost like adding a third surface. In the following paragraphs I will explore how Bourgeois used the combination of additive and reductive mark making within her work.

Untitled (2002) by Bourgeois uses a combination of a reductive line, which is then in-filled with an additive white wax pencil line. The contrast between so many elements in this work makes it so compelling—dark and light, flat and turbulent, still and active. The dark night sky rests quietly in top of the picture plane, while the white, waxy, turbulent sea of linear marks at the bottom of the image busily churns. By using simple contour lines, Bourgeois' drawing represents the undulating, heaving waves of the sea; the lines provide movement and disorder. She uses a combination of cutting back through a material to create linear marks and then in-filling the cuts with a wax medium so that there's a stark contrast between her substrate and the lines. The use of repetitious lines, varying the space in between each wave gives a sense of movement and perspective. The lines peak and fall with the movement of the water. The use of perspective and a change in the rhythm of the lines alludes to a change and rhythm in the water. Bourgeois has also exploited the use of three surfaces by using additive and reductive traces on her substrate, which allow her lines to suggest new spatial dimensions. This work highlighted particular characteristics of line to explore within my own research, such as the ability of line to shape space. Bourgeois used the peak and fall of her lines to create new rhythmic patterns on the surface. Through the use of the slightly raised white lines, in contrast to the flat blackness, there is an alluring sense of perspective.

Untitled (2002) illustrates how combining both added and reductive traces, as a means of line making, provides a complex three-dimensional drawing surface that can explore space through the use of line. With the addition of new surfaces to a two-dimensional plane, there is more variance in the surface, essentially more room to explore space through the use of perspective. By varying the planes on the surface, through line, it is possible to create a new

Fig. 1.5 Mel Douglas, *Reductive engraving* 2015 (detail), kiln formed, coldworked and engraved glass, 20 x 40 x 5cm. Photo: David Paterson.

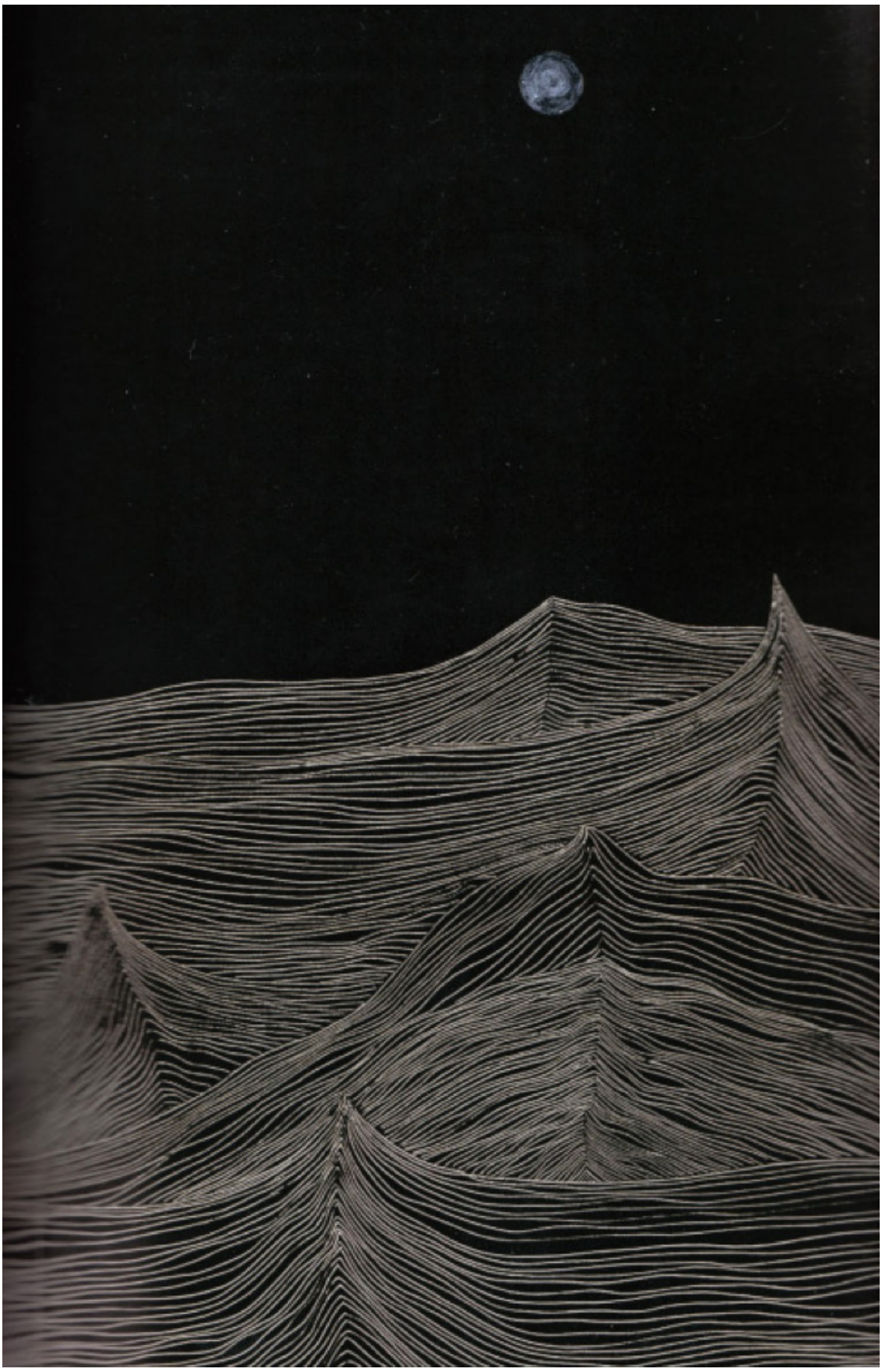


Fig. 1.6 Louise Bourgeois, *Untitled* 2002, engraved drawing and wax pencil, 30 x 40cm. Robischon Gallery, Denver, Colorado, USA. https://www.robischongallery.com/artist/LOUISE_BOURGEOIS/works/5808.

space. Bourgeois work drew alerted me to the possibilities of combining additive and reductive traces in glass. As glass can be worked in many different states: hot as a soft malleable material, painted with, printed on and carved into. I was excited see where this combination of line could take my research.

Trace was the next category Ingold identified, which sits in between additive and reductive line, being a line that is both non-additive and non-reductive. This is where a mark is left not though the removal or addition of a material, but through a change, for example, a drawing in sand made using your finger. This category of line has so many applications within glass. As glass uses heat as a way to form it and manipulate the surface, there seems to be endless possibilities within this sub-category of Ingold's classification of line. The way glass transforms from a solid, hard and brittle material into a soft, malleable and flexible material when hot, offers many possibilities for line making. Hot glass lines can be inscribed, stamped, pressed, embossed, formed, imprinted and inlayed into the surface as a means of using line to explore space. This can all be achieved through trace lines.

Michael Heizer's *Circular Surface, Planar Displacement Drawing* (1969) (Fig. 1.7) indicates how through the disruption of a surface, linear marks can be made. Heizer's work, as documented by Gianfranco Gorgoni, is circular tracks left by a motorbike driving in the desert. The tyre marks that disrupt the flat surface of the earth leave behind traces and tracks of movement. The circular lines become reminiscent of circular landforms. The contrast between a flat stark landscape and the lines of disruption almost give the tyre marks the appearance of a void, as if areas of earth have dropped away around circular islands. These areas of darkness make the circular solids look as if they are hovering in the landscape, unattached to the flat, vast desert. Heizer's work reminded me of patterns that start to form on the surface of glass when it is ground away using an abrasive powder. The abrasive starts to form mounds on the outside of circular linear scratches. Usually this is just a means to an end, however I am always conscious of the marks left on glass by this process. *Circular Surface, Planar Displacement Drawing* (1969), allowed me to consider this phenomenon as a drawing rather than just a process.

Ingold goes on to suggests that cuts, cracks or creases are 'created not by adding a material to surface, or by scratching it away, but by ruptures in the surfaces themselves.'[34] These might be caused accidentally, but can be controlled and used as a means of mark or line making. Wassily Kandinsky wrote in his influential 1926 text, *Point and Line to Plane* of 'a particular capacity of line [is] its capacity to create surface.'[35] The way the moving, linear edge of the spade cuts a level surface of the soil, as in an archaeological section for example, creates

34 Ingold, *Lines: a brief history,* p44
35 Wassily Kandinsky, *Point and Line to Plane*, 1926. Dessau: Bauhaus Books.

a new vertical surface in the process. Lucio Fontana's cut canvasses used spontaneous yet controlled cuts in his surfaces. This can link drawing to ideas of rupture and disturbance and locate drawing and line making in negative spaces and voids. Fontana employs the use of cuts or ruptures within the planes of his work as a way to engage with negative space. Fontana began to make holes (or buchi) and slashes through his canvases in 1949–50. (Fig. 1.9) At its simplest, this can be seen as marking the movement of the artist's hand, like the brushwork in Abstract Expressionist painting. However, the puncturing ensured that Fontana literally cut between the spaces occupied by the viewer, through the surface of the canvas, to the space that lies beyond. Fontana saw this as evocative of infinity, claiming 'I have created an infinite dimension.'[36]

By thinking about the space that lies beyond a surface as a means for moving line onto space was a revelation. It made me reconsider how I viewed the materiality of glass. Each sheet of glass was now a way of moving between two planes. Each sheet of glass is a three-dimensional surface, it has a front, a back and four sides. In a singular plane of glass there is a spatial distance from the foreground into the background, this adds volume and space for line to travel upon and within. Exploring cuts, cracks and creases let me see new possibilities of combining the transparency, translucency and opacity of glass, using it as a way to think about how line can move through and into a space. Examples of how I explored all of Ingold's lines and how the *Line Map* directed my own material tests is articulated in the next chapter. *Line Map* defined the parameters and positioned my research project, providing me with a baseline to work from.

My *Line Map* was a way in which I developed a comprehensive comparative classification of line. By introducing each of Ingold's categories, supported visually by works within the field of contemporary art and studio glass practice, I was able to appreciate what line could be. It also highlighted distinct properties of glass that could be used for unique line making methods. The *Line Map* highlighted possible gaps in Ingold's classification and also gave me an abundant amount of material to test within the studio.

The next chapter focuses on the utility and potential of glass as a means for line making under the structure of Ingold's taxonomy as a series of material tests. My material tests let me investigate the applicability and capability of glass as a line making material. These material explorations were guided by my research as well as the material qualities of glass. The map had shown me some of the limits that glass posed, along with a new capacity for glass.

36 Tate Modern. 'Spatial Concepts.' *Lucio Fontana* 1949–50. URL: http://www.tate.org.uk/art/artworks/fontana-spatial-concept-t03961 (accessed 22/7/2016).

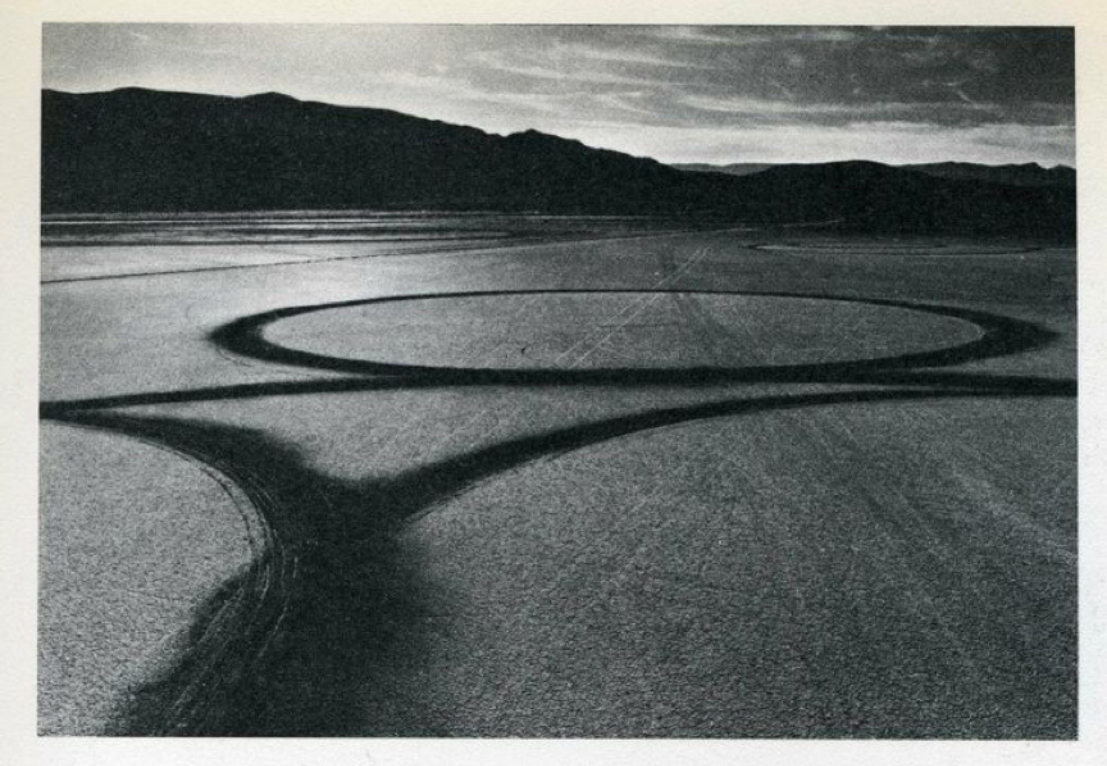
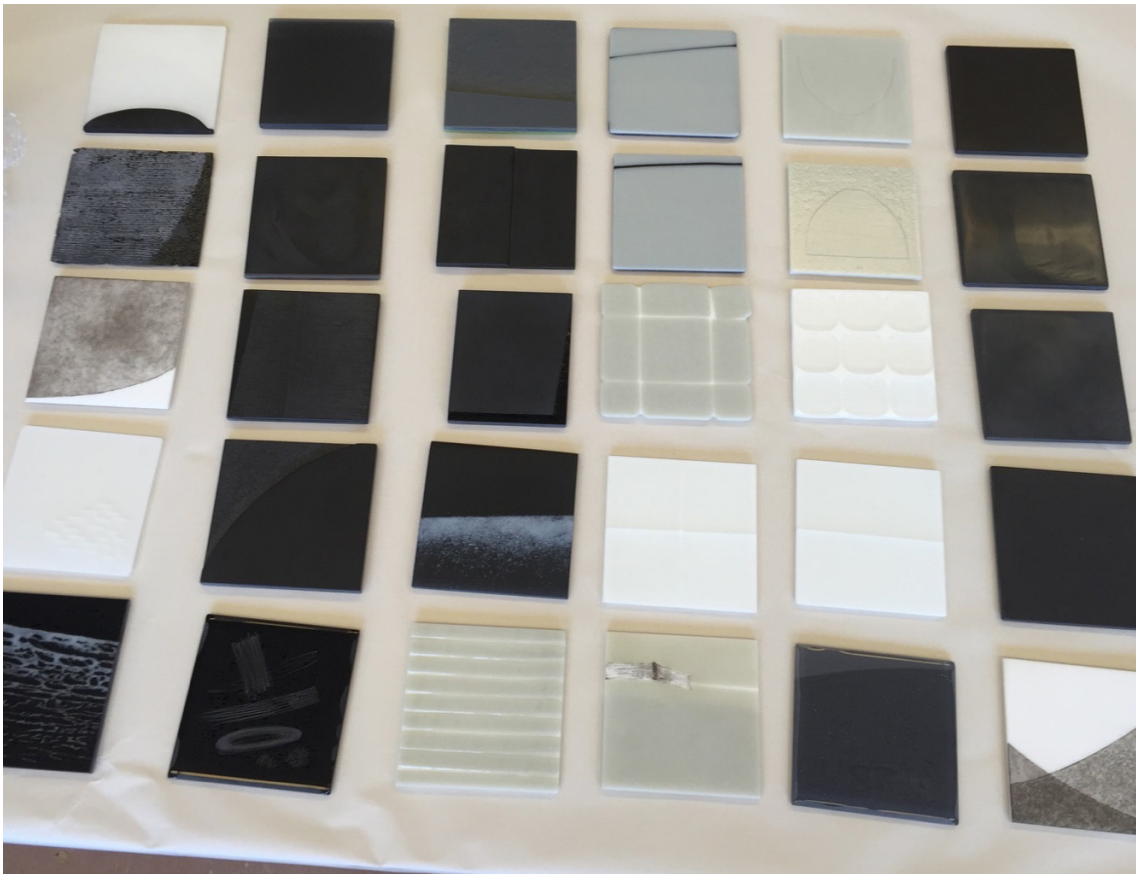


Fig. 1.7 Gianfranco Gorgoni, *Michael Heizer's Circular Surface Planar Displacement Drawing 1969* 1970–72, gelatin silver print, 24.8 x 36.4cm. © Gianfranco Gorgoni, Courtesy Getty Research Institute, Los Angeles, USA (2008.R.6)

Fig. 1.8 Lucio Fontana, *Concetto Spaziale* 1965, unprimed canvas, 92 x 73cm. © Fondazione Lucio Fontana, Milan, Italy.



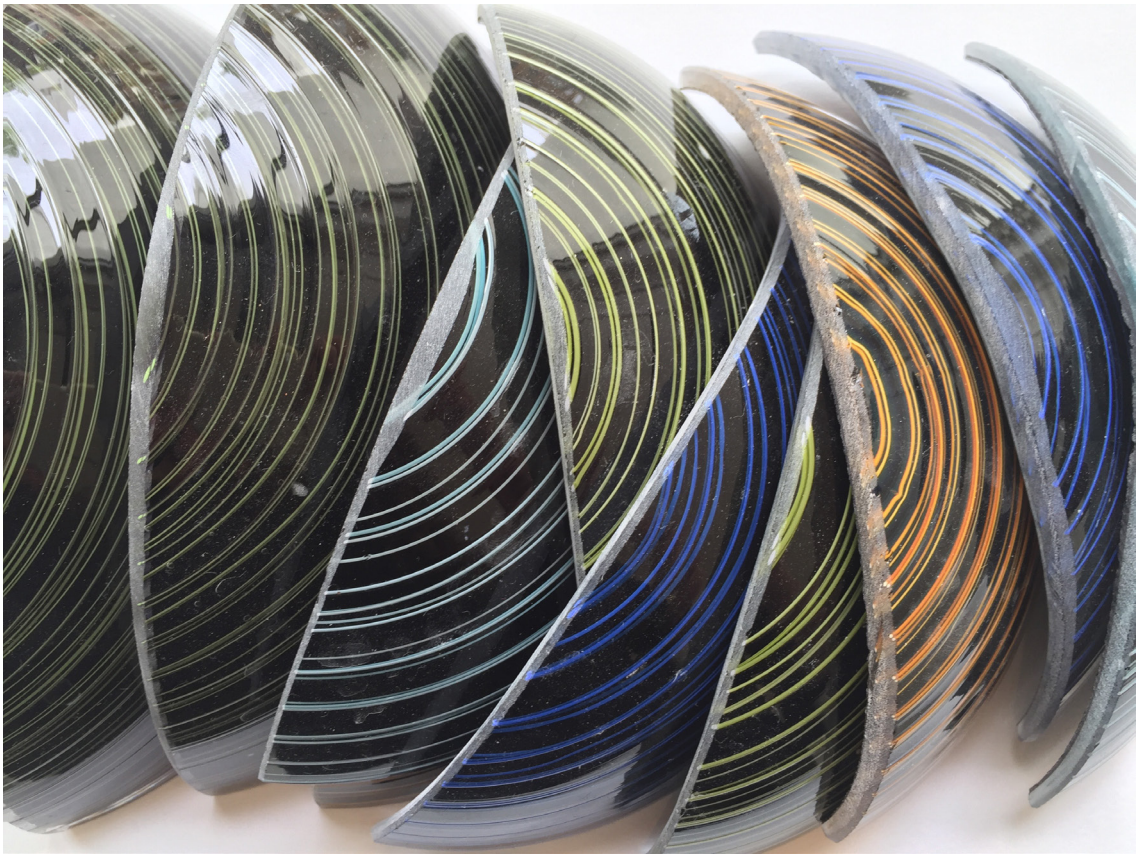


Fig. 2.0 a–b Mel Douglas, *Studio exploration* #1 2015, kiln formed, coldworked and engraved glass, ink and pencil, dimensions variable.

Chapter 2: Drawing the line

Many of the art works included in my *Line Map* became visual prompts for a series of studio-based material tests. I took the approach that to better understand a material I would push its limits to see where it crossed over with other materials. I began by making use of conventional methods of surface treatments in glass. This included engraving, stippling, enamelling and exploring the use of additive traces of glass in the form of individual glass filaments. These initial material investigations started as two-dimensional explorations. All of the initial material tests were made using blown glass, kiln formed glass, and coldworking and drawing processes. Blown glass is glass worked hot from a furnace, kiln forming refers to the forming of glass using heat and gravity in a kiln. Coldworking is the process of working the glass once it has cooled. Some of the processes which fall into the category of coldworking are either for practical means of finishing (like grinding a flat base or removing tool marks) or the removal of additional unwanted material. Additionally, coldworking also refers to many other ways of forming, shaping or marking glass.

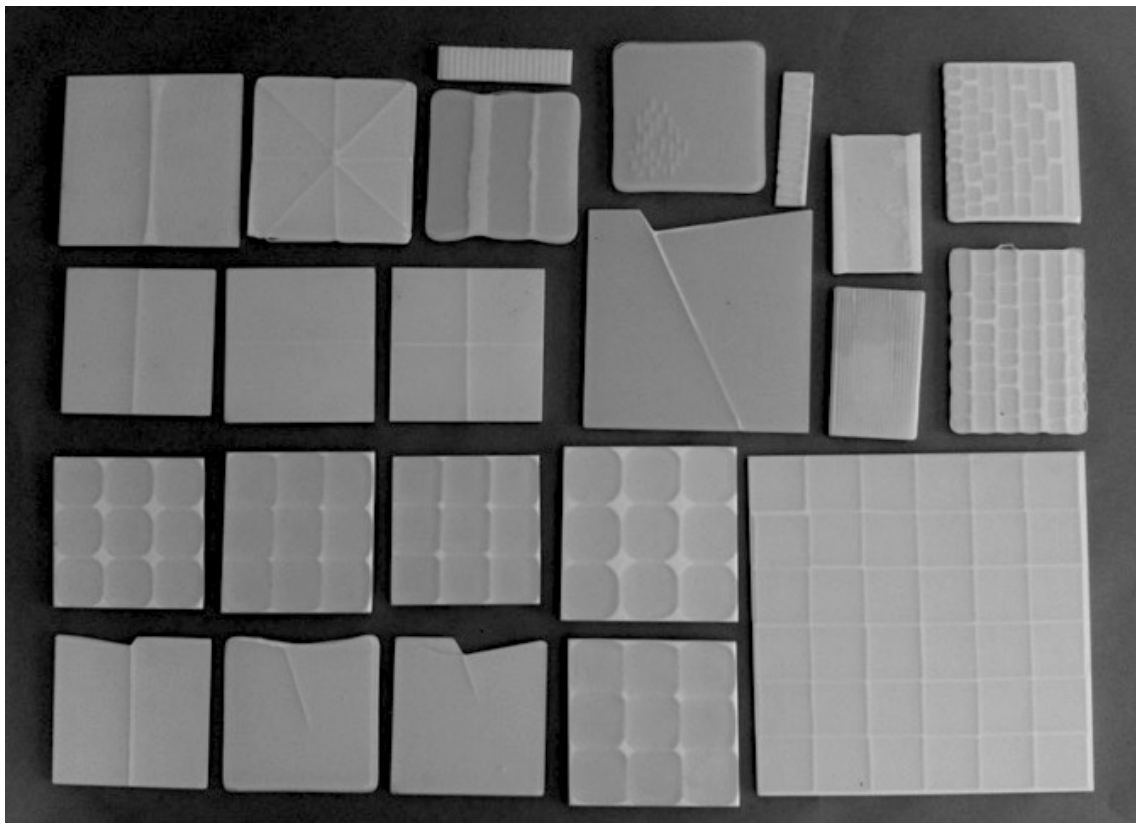
My goal was to think of the glass not as a substrate for my drawing practice but rather a vehicle for engaging with space through removal of material, and with erasure and disruption, using the techniques listed above. Through such explorations I developed a better understanding of the conventions of drawing and how they can allow me to explore the relationship of line, form and space in glass.

Artist Toots Zynsky noted:

> I still think that one of the best ways to learn about glass—and to start to have a deep understanding of it—is by working with it...You learn that you have to work with glass, that you can't just impose your desires on it, because it's always doing something on its own. Glass moves, it's hot, and you have to be moving with it. It breaks pretty quickly if you don't do the right thing, which is one of the qualities about glass that I find strangely positive.[37]

By putting the many glass working possibilities through studio experimentation, I developed new ways of working with line, alongside glass. I undertook a series of material tests, responding to my *Line Map* to explore the material specifics of contemporary studio glass through the exploration of line. It made me reconsider how I use glass as a drawing material

37 Toots Zynsky in Beverly Copeland, 'Toots Zynsky.' Excerpts from *Glass Focus*, June/July 1997 in *Midwest Contemporary Glass Art Group*. URL: http://midwestcgag.com/toots-zynsky/ (accessed on 7/9/2017).



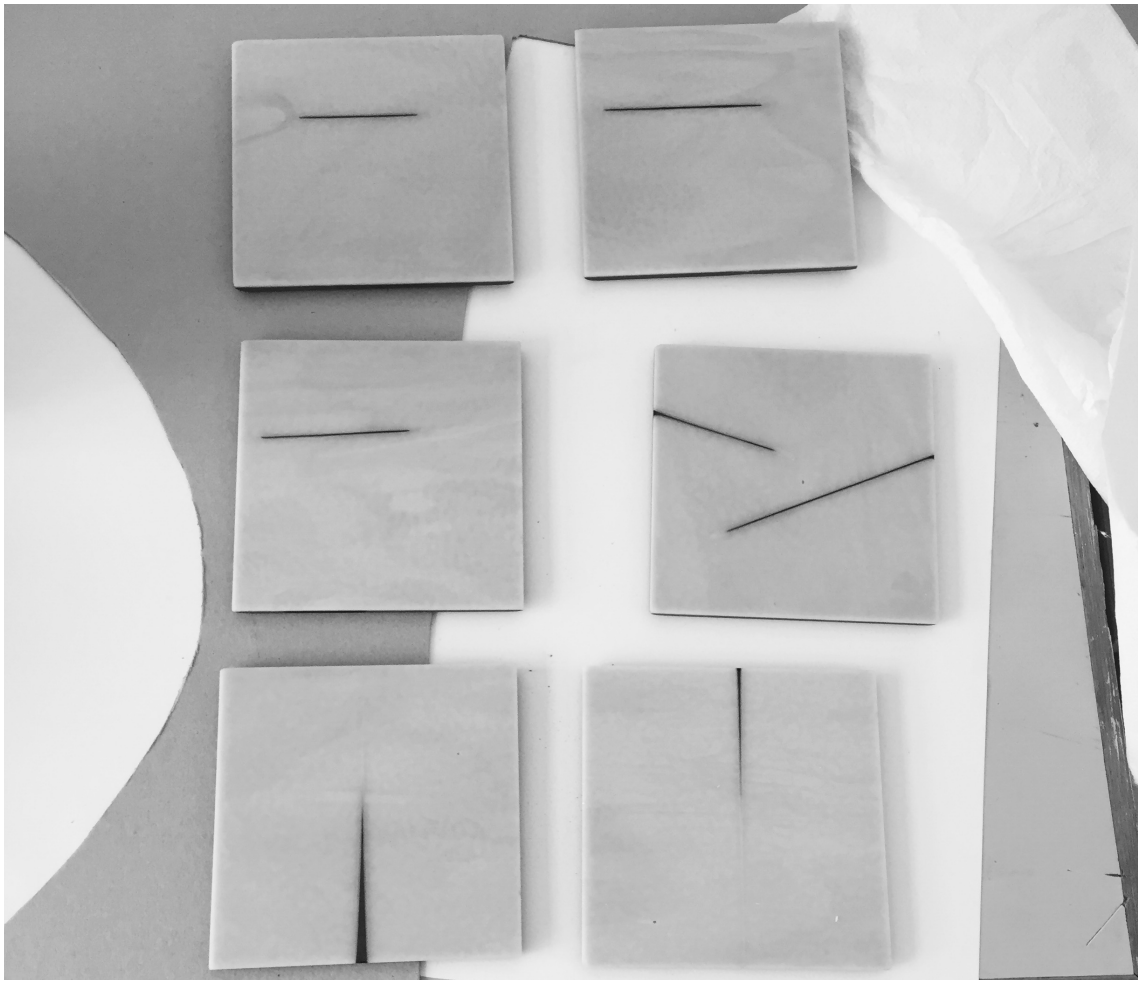


Fig. 2.0 c–d Mel Douglas, *Studio exploration* #1 2015, kiln formed, coldworked and engraved glass, ink and pencil, dimensions variable.

and identified unique properties and potentials that glass offers to extend the field of drawing. It revealed new avenues to mine the properties of glass as a means to explore line. My material explorations supported my initial research and brought to light innovative ways of using glass as a unique line making material to explore space.

Writer Paul Carter talks about the importance and connection of theory and practice:

> ...creative knowledge cannot be abstracted from the loom that produced it. Inseparable from its process, it resembles the art of sending the woof-thread through the warp. A pattern made of holes, its clarity is like air through a basket. Opportunistic, it opens roads.[38]

The studio testing that followed my *Line Map* allowed me to be 'opportunistic', and take advantage of the 'open road' that my *Line Map* had exposed. In the following sections I will detail some of the explorations which were in direct response to the findings, discoveries and tribulations encountered. The following experiments are also categorised according to Ingold's line classifications.

Threads

Ingold defines his first line classification 'threads' as those which 'entangle and entwine freely with other lines.'[39] This can be a problematic process when applied to glass. Like metal, if glass is thin enough it can be made into flexible threads. Optical fibre, glass rope and fine strands (stringers) are examples of ways in which glass can be pulled into thin, malleable threads. Once glass is thin enough, lines can be interwoven to form threads. However, this supposes that all threads are strong enough to support their own weight and are flexible enough to be interwoven. The flexibility of 'threads' is a contentious term for many glass lines. Unlike metal or wire, glass threads need to be extremely thin to roll or bend, which makes them extremely fragile. There is a limit to their flexibly and plasticity. As a counterpoint to this, to form glass threads into intricate shapes often requires the aid of heat. When glass lines are hot enough, they become malleable which allows them to be shaped or manipulated. However, often glass cannot hold that flexibility at room temperature.

Many of the glass threads I explored within my own material tests were formed hot which enabled the manipulation of the threads. Or they were constructed from fine, thin flexible threads of glass, that were interwoven using heat, rendering the object solid and inflexible. They meet the criteria of 'threads' as they were suspended in three-dimensional space, however, these lines do not possess the same kind of flexibility of other threads like metal,

38 Paul Carter, *Material Thinking: The Theory and Practice of Creative Research*, 2004, Victoria: Melbourne University Publishing, p7.
39 Ingold, p2.

Fig. 2.1 Mel Douglas, Working image, *Studio exploration (thread) #2* 2015, glass, dimensions variable. Photo: Louis Grant

Fig. 2.2 a–b Mel Douglas, Working image, *Studio exploration (vitrograph) #3* 2015. Photo: Louis Grant

wire, twine or string. My exploration of glass threads led me to work with pulled, fine, single strands of glass called stringers. The process of making these fine strands of glass is achieved by heating a pot of glass in a specialised kiln, called a vitrograph. The kiln has an open aperture in the bottom, this aperture is plugged until the glass reaches maximum heat.

Once at optimum heat the glass becomes a free flowing, soft and fluid liquid, and the plug can be removed. Using a pair of tweezers, the glass is pulled from the bottom of the kiln and manipulated into fine strands of flexible glass. The weight and thickness of the glass can be altered by varying the temperature of the kiln or by changing the speed in which the glass is manipulated. The individual glass threads are flexible but also very brittle.

I experimented with weaving glass threads into flat loose nets, exploring varying ways to achieve shifts in tone by changing the placement and density of the glass threads across the object. Moving from concentrated areas, contrasted with sparse areas created a tonal shift across the flat surface. This graduated tone gave the two-dimensional object a sense of space and form. After weaving the threads together, I found that the form had no structural integrity, each element was interwoven but remained loose, the composition would have transformed back into a pile of loose individual threads if disturbed. Using a low heat in the kiln (680 degrees Celsius), I gently fused some of the junctions of the threads together. This gave the construction integrity and the ability to exist suspended between two points in space.

Line as thread

Studio exploration (line as thread) #4 (Fig. 2.3) demonstrates the ability of loose linear glass threads to be bound into a fixed linear matt. Exploring Ingold's category of line as thread opened up scores of new possibilities of using glass as a drawing material, either on a flat surface or on the surface of a three-dimensional glass substrate. I was able to transform larger pieces of glass into fine filaments, which then had the flexibility to be entwined, entangled and woven together to build a surface. Through this explorative process, some of the problems I encountered led to new modes of investigation and new factors I had not previously considered. The size of the 'threads' being created presented different opportunities. Working on a small scale with glass threads was constraining. When glass is stretched into thin strands is becomes extremely brittle, it requires gentle and considered manipulation to form or entwine it. Working with larger 'threads' suited the nature of the material and the way that it wants to move, arc and bend. Glass likes to arc and bend in subtle movements, which lends itself better to working on a much larger scale than my initial tests. This led me to develop some larger scale gestural works using threads. (Figs. 2.3 and 2.4) This is discussed further in Chapter 6.

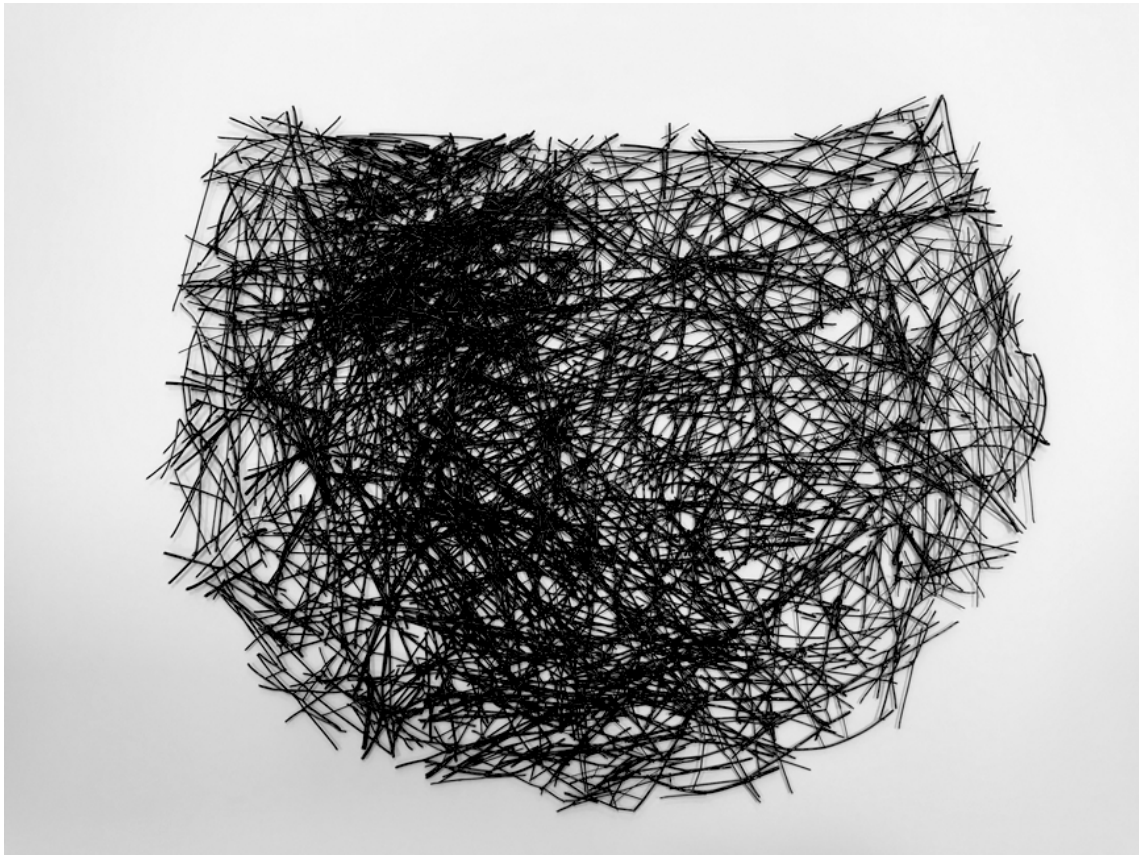


Fig. 2.3 Mel Douglas, *Studio exploration (line as thread) #4* 2015, glass, 20 x 20cm.

Fig. 2.4 Mel Douglas, Working image *Studio experimentation (line as thread) #4* 2015. Photo: Louis Grant.

Additive traces

The next of Ingold's categories I tested, additive traces, are those that are made by applying material onto a surface. There are many possibilities of applying additive traces to the surface of glass as a means of line making, some deliberate—some by chance. Many substances leave a trace on the surface of glass. Most traces go unnoticed or are unintentional. Through the simple act of touching a piece of glass with your finger, or gripping it as you lift it to your mouth, you are leaving a linear trace. A touch leaves your unique set of lines (fingerprint) on the surface, as an oily additive trace.

Additive traces can build new spaces and form new complex surfaces. As seen in the work of Moje-Wohlgemuth by layering multiple fields of lines, new multi-dimensional surfaces and spaces can be derived. In the studio I first explored line as an additive trace by applying conventional drawing materials to glass, investigating what materials leave traces on glass and how permanent that trace is. While most drawing materials left a mark on the surface of glass, if the surface was fire polished and smooth the mark was often extremely subtle. The best results were achieved when the glass had a matt surface as the porous substrate takes on more of the drawing medium. In most cases the additive trace remained intact if undisturbed. One of the materials I experimented with was lead pencil which left a fine crisp line across the surface. If this surface came into contact with any other surface it smudged onto the surface of the glass. I also tried ink, charcoal and paint. All of these materials left an additive trace on the surface of glass, but I found that none adhered permanently to the surface. (Fig.2.5)

Some of the results and outcomes of this exploration were curious, as the additive trace often became a reductive trace, through the impermanent juncture or adherence of the two materials (trace and substrate). Any contact with another surface would immediately change the classification of line. The second experiment examined more permanent and enduring means of line making. I began by using glass as a drawing material in as many different forms as possible. One technique I trialled was enamelling, which has a long tradition of line and image making within the field of glass. (Fig 2.6) The technique of enamelling was first used to decorate glass vessels during the Roman period. Designs were painted freehand over the top of outlined incisions. This technique originated in metalworking but was later used for decorating glass.[40]

Glass enamelling uses fine-ground glass, in the form of a powder, mixed with a binding agent, which forms a gritty paint-like substance. The enamel is painted on the surface of the glass in a cold state. Once the enamel is dry, the glass is fired in a kiln at a temperature between

40 Susanne Greiff and Jan Schuster. 2008. "Technological Study Of Enamelling On Roman Glass: The Nature Of Opacifying, Decolourizing And Fining Agents Used With The Glass Beakers From Lübsow (Lubieszewo, Poland)". *Journal Of Cultural Heritage* 9: e27-e32. doi:10.1016/j.culher.2008.06.006.

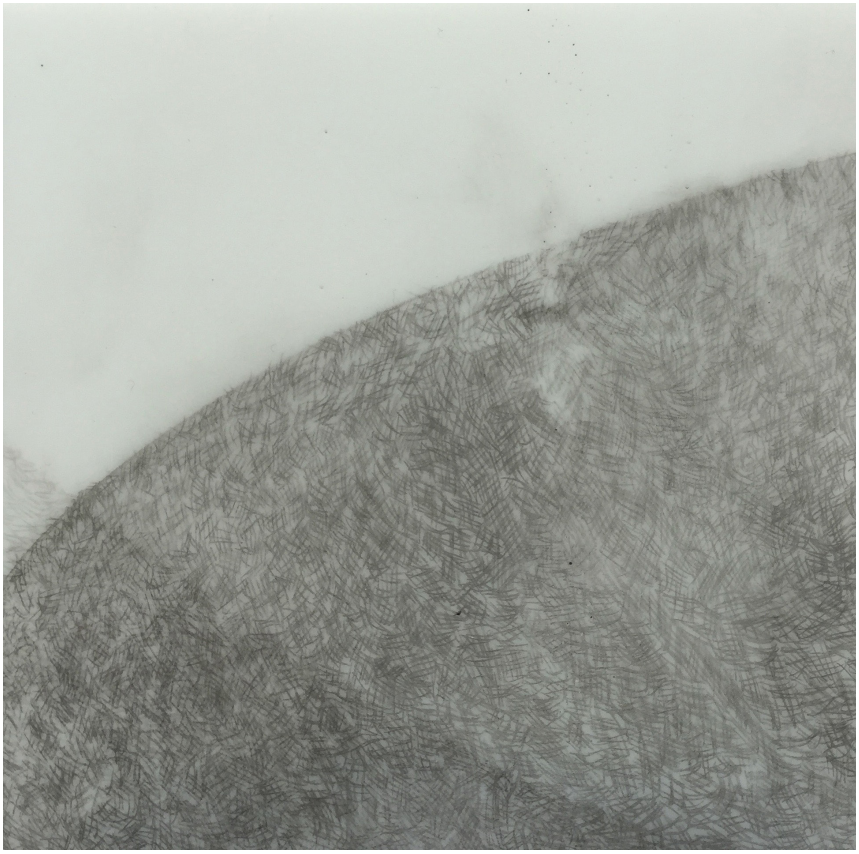


Fig. 2.5 Mel Douglas, *Studio exploration (additive trace) #5* 2015, kiln formed, coldworked glass and lead pencil, 15 x 15cm.

Fig. 2.6 Mel Douglas, *Studio exploration (additive trace) #6* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

650–800 degrees Celsius. The powder melts and forms a smooth additive trace on the surface of the glass, adhering permanently to the substrate. The technique of enamelling, I came to understand, shares the same qualities as drawing on paper in that they both apply a low viscosity medium onto a backing surface and leave marks. Enamel painting is especially linked with ink painting, because the viscosity of glass enamel resembles that of liquid paint, and they both use paintbrushes or nibs for application. In my own exploration of the additive trace, enamelling allowed me to map the surface of objects through the use of line. I explored the use of simple, loose, repetitive lines that surveyed the surface of the substrate, running from the top of objects, fanning outwards toward the base, using line to follow the shape of the object. In addition to exploring enamelling, I tested Ingold's concept of the additive trace through the following means: stringers (fine filaments of glass) or trails of glass, glass powder drawings and adding layers of additional strips of glass as line.

Studio exploration (additive trace) #7 (2015) (Fig 2.7) is a blown vessel with a ground and sanded matt surface. White enamel was applied to the surface as an additive thread. The paint is applied when the glass is cool, and is baked onto the surface of the glass in a kiln. The most striking outcome of this test was the contrast between the surface of the glass and the surface of the enamel. The glass surface is very even, soft and stone like, in contrast to the white enamel lines that are semi-translucent, and satin in finish. Another notable observation is the connection between the surface and the substrate. The enamel sits proud of the surface, both the substrate and the enamel are noticeably two different materials. The method of applying a glass enamel cold and firing it onto the surface of the glass lets the two materials bond, but they do not become one homogenous body of glass. This is in opposition to many other glass techniques that use heat to connect or fix two materials together. The application process is also noticeably different from many other ways of working with glass. Before the glass enamels are fired onto the surface of the glass, it can be removed easily with a rag and water. This also differs from many other ways of working with glass, as most are permanent—offering only one attempt to achieve an outcome.

The linear traces in *Studio exploration (additive trace) #8* (2015) (Fig. 2.8) were added to a glass surface by laying powder down on a kiln shelf in lines, placing additional sheets of glass on top of the powdered lines and then firing the stack. The sheets of glass become soft and viscous and stick to the dry additive traces. The powder traces change with heat, they begin to stick together and form thin strands of glass. Together they create an interesting dry, almost stone-like surface. There are many possibilities of line making with glass using an additive trace. Some are fleeting and impermanent while other are enduring marks left as a trace on the surface of glass. Exploring additive traces in glass made possible new techniques of line making that I had not used within my own practice.

Fig. 2.7a Mel Douglas, *Studio exploration (additive trace) #7* 2015, blown, coldworked and enamelled glass, 15 x 10 x 10cm.

Fig. 2.7b Mel Douglas, *Studio exploration* #1 2015, (detail) kiln formed, coldworked and engraved glass, ink and pencil, dimensions variable.

Reductive traces

Ingold's category of reductive traces are those formed by removal of material relationship of surface and form. I have often before use engraving as a means for mark making, which is the removal of material to create lines through the surface of the glass. There are many ways to achieve and use reductive traces lines with glass as a means for line making. As with wood, sandblasting will remove material leaving line. Acid etching, grinding with a cutting wheel, stippling and engraving are also techniques that erode or remove glass, leaving a reductive trace. As with enamelling there is also a long history within glass making using these techniques, however, not many artists employ these techniques within the field of contemporary glass. These ways of working are often very labour intensive, time consuming and require a high level of skill. Within the field of contemporary glass, the primary use for engraving is often for figurative portraiture or for decorative surface design.

Exploring reductive traces, I engaged with concepts of trace, evidence of the hand, the tool and erasure. Through the removal of material, I noticed I was able to build bands of lines, creating depth depending on where I stopped or began a reductive trace. This stopping and starting enabled me to experiment with changing the surface plane through the density and value of each line.

While researching reductive traces I came across a quote from Louise Bourgeois, about the 'symbolic power' of metal engraving, referring to its ability to 'convert aggression' into something useful. But she bemoaned the fact that strength and control were required to push the burin through the metal plate. She complained that she did not have the necessary 'biceps,' but that she loved the stiff, assertive, tactile quality of the engraved line.[41] Although she was referring to printmaking, and the physicality required to produce an engraving, this quote had resonance with the physical movement and energy required when removing glass to create a line. The physical action is recorded through the enduring mark that is left behind. It can be stiff and assertive, or alternatively soft, gentle and meandering.

Glass is a strong material, there are a variety of tools or ways that you can vary your mark, each require differing amounts of energy, and each gives a different type of line, from the lightest touch to a deep gouge. As part of my material investigations I started a chart of reductive traces, taking note of the varying characteristics of line that can be made reductively into glass.

The banded sections in *Studio exploration (reductive trace, banded sections) #9* (2015) (Fig. 2.9) give the flat piece of glass volume, dividing the surface into three planes, through small

41 Museum of Modern Art. nd. 'Techniques: Engraving,' in *Louise Bourgeoise: The Complete Prints & Books*. URL: https://www.moma.org/s/lb/curated_lb/techniques/engraving.html (accessed 5/2/2017).

Fig. 2.8 Mel Douglas, *Studio exploration (additive trace) #8* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

steps of engraved lines. I experimented with the pressure of my engraving to create subtle tonal variations (light/shade) giving the exploration rhythm and depth. When working on this exploration, I was drawing on my earlier study of the etymology of line, and conceiving of line as a textile thread. The process of engraving multiple strokes of reductive lines, layered one on top of another building form created a new surface. The act of drawing the lines, making them overlap, weaving and entwining, so that each mark becomes indistinguishable, built the singular into a field or a surface. This idea of line overlapping and weaving led me to think about the act of drawing as an open-ended activity. Drawing starts with a line that unfolds, it moves and continues indefinitely into space. As you begin to make a drawing, a mark becomes a line, line becomes contour, and contour becomes an image or a field.

Studio exploration (broken bells) #10 (2015) (Fig. 2.10) is an example of reductive linear marks created through the use a stipple (diamond pointed pencil) to remove material from the substrate. Using short, light stokes I built thousands of small reductive traces that arced across the surface, creating a single volume. This tool is traditionally used for stippling, which is tapping at the surface of glass with the point of the tool, leaving tiny fractures in the surface. *Broken Bells* utilised the stipple unconventionally, more like a pencil, scribing small patches of lines across the surface of the glass. This was a slow and methodical process, I drew for an hour a day over a period of three months. I was intrigued by the daily changes in the lines, each mark mapped the smallest grip change, the tiniest change in direction of line, recording the pressure of my hand. Using a reductive trace, I eroded the surface, recording time and the trace of my hand.

In contrast to the highly marked surface, I left an area of unmarked glass at the bottom. The juxtaposition of these two opposing surface qualities highlighted the ability of reductive traces to reflect or absorb light and engage with the space around them. Through the exploration of reductive lines, I started to reconsider what it means to engrave the surface of glass. Not only am I inscribing lines into the surface, through the act of removing material, I am creating a new surface.

I noticed that reductive traces reveal and expose parts of a substrate that usually remained unseen or unexploited. In the case of reductive engraved lines on glass, it made me value and understand the simplicity in rupturing or disrupting a glass surface—and how that disturbance becomes a vehicle to hold light. The fracture edges of the removed line become small lenses that reflect light. The exposed lines removed from the surface not only reveal the inner make-up of the material, they also identified a new element, the original substrate's surface, which in contrast starts to become its own linear element sitting against the course, rough, reductive line.

Fig. 2.9 Mel Douglas, *Studio exploration (reductive trace, banded sections) #9* 2015, kiln formed, coldworked and enamelled glass, 15 x 15cm.

Fig. 2.10 Mel Douglas, *Studio exploration (incise) #10* 2015, kiln formed coldworked and stippled glass, 80 x 80cm.

Additive and reductive traces

Additive traces can be added to the surface of glass during the blowing or kiln forming process. This can be either in the form of a glass powder or by using pre-fused (pre-made) elements of glass. These additive traces are fixed to the surface of the glass using the heat of a kiln or the heat of reheating chamber for blowing glass. After glass has been formed, in either the hot shop or the kiln, it is commonplace for the glass to require some coldworking or finishing. Combining both additive and reductive traces provided the opportunity to see what was possible when adding line to the surface combined with line that cuts through both the substrate and the additive trace. Exploring this type of line effectively provided me with three layers of surface to explore the use of line.

The following two examples show the use of trace lines both additive and reductive. I found that building new layers of line with additive materials gave me a low relief surface, which combined with reductive lines provided the opportunity to work on an entirely new plane. This allowed me to achieve dynamic three-dimensional surfaces.

Studio exploration (additive and reductive) #10 (2015) (Fig. 2.11) was my second examination of combining additive and reductive traces. The substrate I chose was a sheet of fused and fire polished black glass. On the surface of the glass I sifted fine white glass powder and fine filaments of glass stringer as an additive trace. I used small hand tools to move the powder on the surface, creating gaps revealing the substrate. These traces were fused to the glass using heat in a kiln. After cooling, I ground back into the surface of the glass, removing material from the substrate, leaving reductive traces across the surface. Following Bourgeois' example, I used the contrasting visual elements to give a sense of stillness and movement. I also reversed the distance between the additive elements from the background into the foreground, which generated a disorientating perspective.

The combination of both additive and reductive traces as a means of line making, provided a complex three-dimensional drawing surface that explored the space of a substrate through the use of line. (Fig. 2.12) With the addition of new surfaces to a two-dimensional plane, there is more variance in the surface, essentially more room to explore space through the use of perspective. By varying the planes on the surface through line, I gained the ability to create new space.

Non-additive or non-reductive traces

Exploring the inverse of Ingold's previous category, non-additive, non-reductive lines highlighted many properties of glass that made this type of line unique to the material. By

Fig. 2.11 Mel Douglas, *Studio exploration (additive and reductive trace) #11* 2015, kiln formed, coldworked and engraved glass, 15 x 15cm.

using the combination of glass and heat I was able to explore many new ways of line making. The following examples show some of the modes of line making undertaken. The use of heat became an important element in this category. Through the use of heat, both in the kiln and in the hot shop, I explored the ways in which once glass is transformed into a soft and malleable material, there are many kinds of line making that can be achieved without the addition or removal of any material.

My material tests highlighted some of the ways of line making in glass using this category: pressing glass (pressing molten glass into a mould to form it); mould blowing glass (blowing a hot bubble into a mould; cast glass (melting glass into a refractory mould to form it); kiln forming (using heat and gravity as a means for mark making); and chemical reactions in the glass (using flashing of reduction in the surface to create lines in the glass).

Studio exploration (non-additive and non-reductive) #13 (2015) (Fig. 2.13) used a simple kiln forming process that achieves a bas relief, textured, or sculpted look in glass. The process involves cutting a pattern or design in ceramic fibre paper, then stacking glass on top of the pattern and firing the piece in a kiln. During firing, the underside of the glass conforms to the ceramic fibre paper pattern, assuming its contours and textures. Using heat, I was able to make non-additive, non-reductive lines in the glass—which also changed the dimensions and form of the surface.

Glass uses heat as a way to form it and manipulate the surface, there seems to be endless possibilities within this sub-category of Ingold's classification of line. The way glass transforms from a solid, hard and brittle material into a soft, malleable and flexible material when hot offers many means of line making. Hot glass lines can be inscribed, stamped, pressed, embossed, formed, imprinted and inlayed into the surface as a means of using line to explore space.

Cuts, Cracks and Creases

Works in this Ingold category show the use of cuts, crack and creases as a means of line making. While cuts are commonly a means for construction in glass, and cracks are not usually a desirable outcome, exploring both of these means of constructing line proved fruitful. The third term, crease was especially curious, because at room temperature glass cannot be manipulated or creased. As I found with some of the other categories in Ingold's taxonomy the application of heat was required to explore this type of line making.

One unique quality that my experiments revealed was that, unlike most other materials, glass can be cut, cracked or creased and then reformed. With some glasses residual evidence remained of the line, and at other times all traces of the line disappeared and a line-free homogenous body of glass was reformed. Another property of glass is transparency—by cutting, cracking and creasing glass you are given a new plane to work within. By cutting

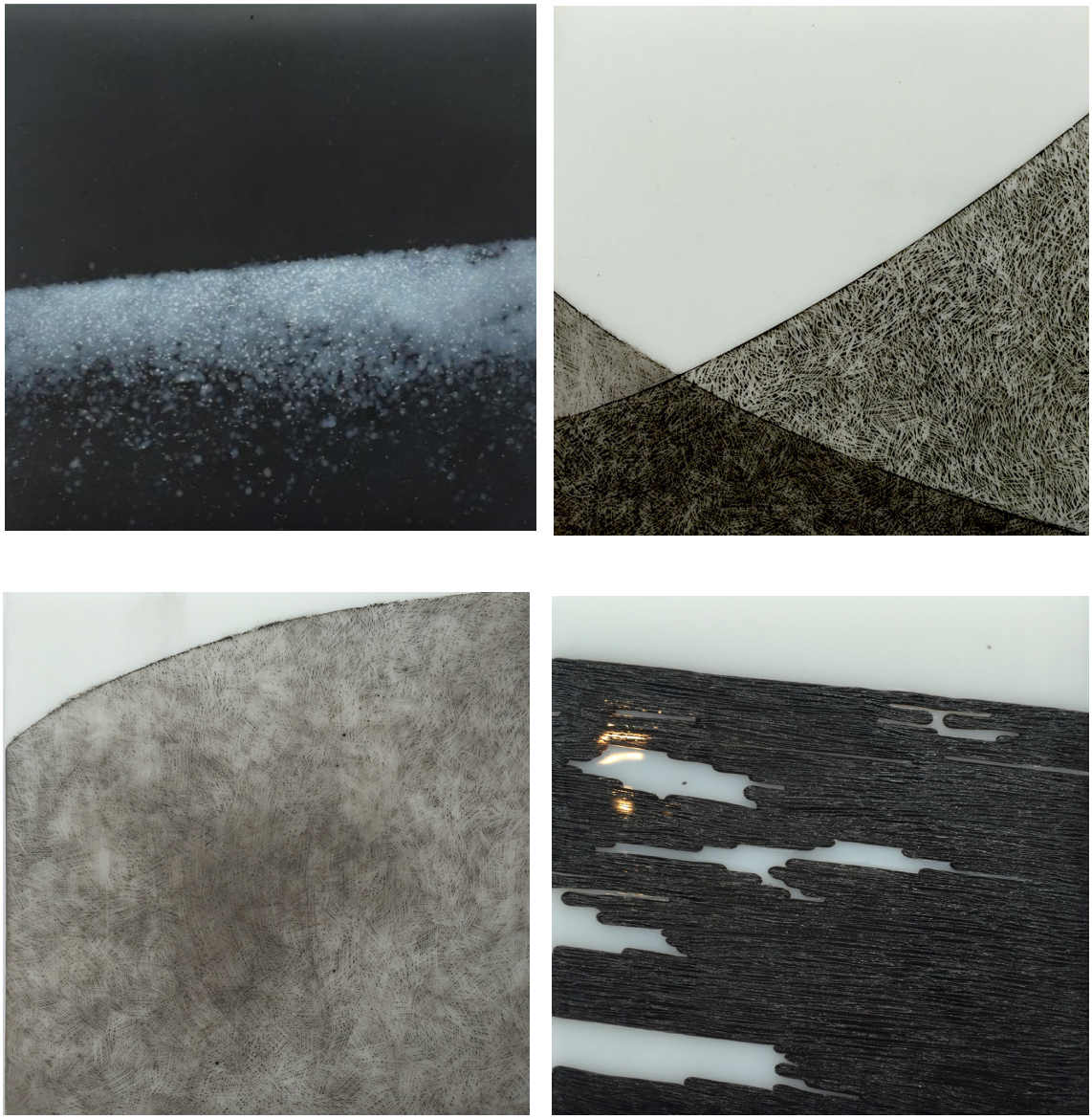
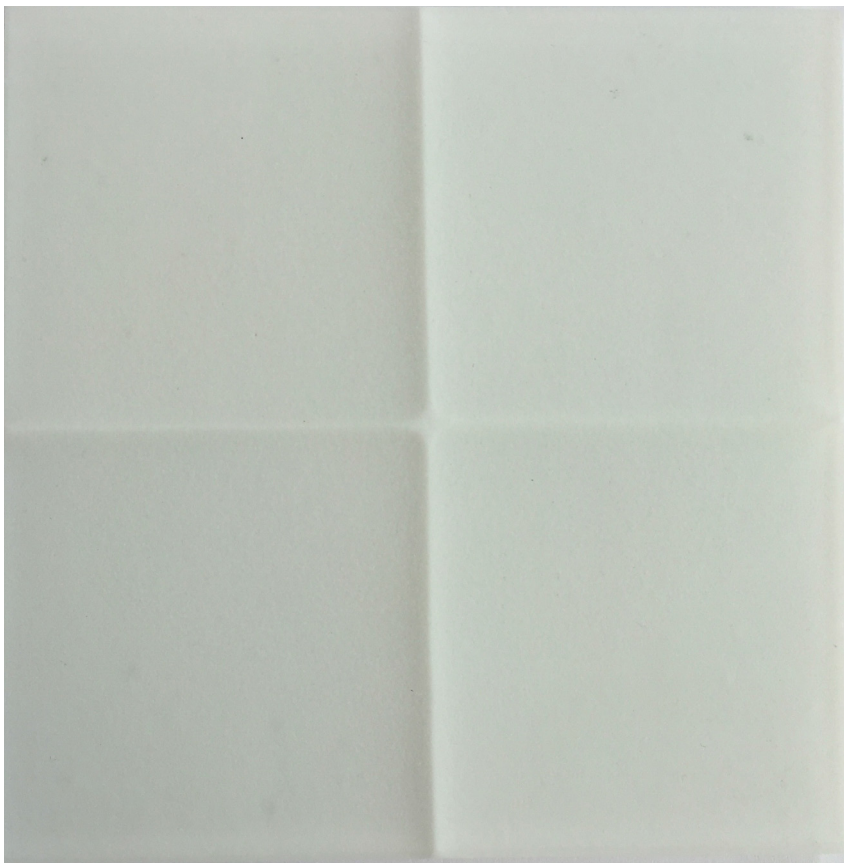


Fig. 2.12 a–d Mel Douglas, *Studio exploration (additive and reductive trace) #12* 2015, kiln formed, coldworked and engraved glass, dimensions variable (group).

Fig. 2.13 a–c Mel Douglas, *Studio exploration (non-additive and non-reductive) #13* 2015, kiln formed and coldworked glass, 3 @ 15 x 15cm.



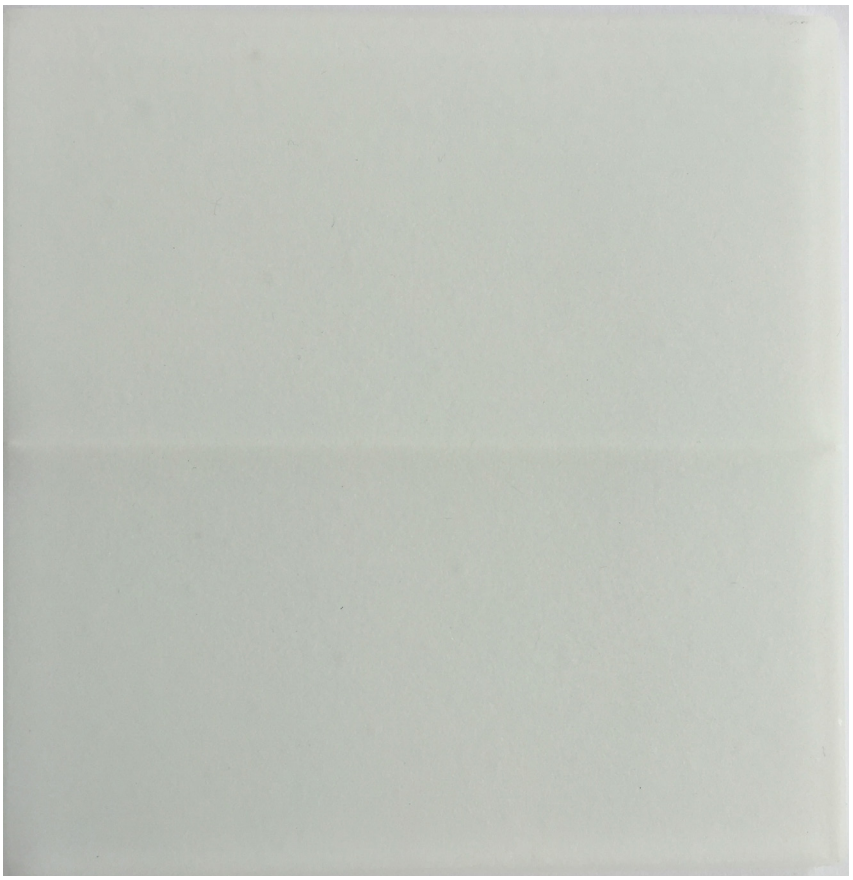


Fig. 2.14 a–b Mel Douglas, *Studio exploration (cuts cracks and creases) #24* 2015, kiln formed and coldworked glass, dimensions variable (group).

Fig. 2.14 c–d Mel Douglas, *Studio exploration (cuts cracks and creases) #24* 2015, kiln formed and coldworked glass, dimensions variable (group).

and constructing using a combination of glasses (transparent and opaque)—the transparent windows offer the opportunity to see within the substrate—this provides additional spatial planes.

Studio exploration (cuts cracks and creases) #24 (2015) (Fig. 2.14) was constructed of two sheets of clear glass and a sheet of white that was slightly larger than the two clear pieces when laid side by side. I laid the two pieces of clear glass onto a kiln shelf, leaving a small gap. The two clear sheets were then backed with a sheet of white glass. The heat of the kiln allowed the white glass to melt and form into the crack between the two cut pieces of clear. When the glass had cooled and I turned over the surface, what I noticed was that I now had a white line that had melted and flowed into the surface of the glass. In the cavity of the cut, which had been laid in the kiln as a crack, was now a crease in the glass. Through the heating process the crack sealed, the glass becoming one homogenous body, thus resulting in a white line, or what looks like a shadow line or light line down the middle of the panel.

The shadow line divides the surface into two separate bodies. The middle crease also casts a shadow on either side of it, providing a new special plane occupied by the line. It is not a line that sits on the surface or a line that removes material from the surface—it is a new three-dimensional line that allows you to see the depth and interior space of the substrate. This experiment utilised inherent qualities of glass to explore the relationship of line, surface and space. Exploring cuts, cracks and creases, thereby combining the transparent, translucent and opaque qualities of glass, allowed me to use it as a way to think about how line can be used to express multi-dimensional space within both two- and three-dimensional forms.

My material tests let me investigate the applicability and capability of glass as a line making material. These material explorations were guided by my research as well as the material qualities of glass. Social scientist Michael Polanyi wrote: that 'no solution to a problem can be accredited as a discovery if it is achieved by a procedure of following definite rule.'[42] The process of discovery I followed in the studio through these material tests involved continual movement between being guided by my own concerns as an artist as well as rules and elements that lay beyond my personal experience. I was striving to see what was beyond what I knew.

Through exploring the physicality of glass line I began to develop visual evidence reflecting what the distinct properties of glass are for line making methods. It also reinforced some of the reservations I had regarding gaps in Ingold's classification. These will be discussed in the following chapter. Most importantly, my studio explorations provided me with new ways to conceptualise and visualise glass lines. The research presented me with new ways of using, applying and thinking about line and its relationship to surface. And that led me to the next field of investigation, focusing on the relationship of lines to surface.

42 Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy*, 1958, Chicago: University of Chicago Press. PhilPapers, URL: https://philpapers.org/rec/POLPKT (accessed 5/2/2019).

Chapter 3: Lines and surface

Continuing my material experimentation, the second aspect of Ingold's taxonomy that was of interest to my research was the relationship he sets up between line and surface. Specifically, the thread and the trace. According to Ingold, the transformation of threads into traces creates surfaces, whilst the transformation of traces into threads dissolves surfaces.

Essentially, Ingold was articulating implicit connections between surface and line, either through line building or line dissolving the surface. My intent was to see if glass lines and their relationships to surfaces, either by building or dissolving, offered new avenues to explore these connections. I could appreciate the distinction between these two ways of building surface; I also realised that within my research to date, I had only built surfaces through traces. In this chapter I outline how I familarised myself with ideas of transforming surfaces, and I discuss this through the works of other artists, my own observations and studio experiments. The first transformation is turning threads into traces, which bring surface into being.

Continuous Mile by Liza Lou is particularly useful in connection to the idea of transforming surfaces, as her process turns threads into traces. (Fig. 3.0) This monumental object is composed of 4.5 million, glossy, black glass beads woven onto a mile-long cotton rope that is coiled and stacked. Standing about 91.4cm high and stretching nearly 152.5cm in diameter. The strands of beads do not decorate the surface: they are threads woven together into a sculptural form that transforms the single threads into traces on a surface. The binding of these threads results in line building surface. This work was pertinent to my research as the lines were not added as a decorative means, they played an important contextual reference to Lou's idea, and the rows of beads intertwined became the structural fabric of the object. The bead lines draw together to create sold mass. By threading the strands of beads together, entwining and looping, Lou turned the thread of beads into an evenly textured surface. She bound her lines together to form a surface, upon which the original threads now figure as traces.

By analysing the use of line by Lou I was able to consider how within my own practice I could use the idea of binding small lines to work in a more expansive scale. Often studio glass is defined by domestic proportions due to materials, and the limitations posed by equipment size. Lou's use of line, through threaded beads allowed her to build line from micro to monumental.

Fig. 3.0 Liza Lou, *Continuous Mile* 2006–08, glass beads and threads, 120 x 230 x 230cm. Photo: The Corning Museum of Glass, Corning, USA.

Studio exploration (transforming threads into traces)# 14 (2015) (Fig. 3.1) used stringers (fine glass threads) set out in multiple layers running in opposing directions. By using layers of both black and white threads laid down in opposing directions, I built a moiré pattern through structure. As the threads were combined and fused together in the kiln – the threads became traces to build a surface. Like Lou I did not start with a substrate, the threads bound together, forming their own new surface. These glass forms were constructed from glass lines bound together to form traces on the surface.

The second mode of transformation is the ability of threads to dissolve surface. American artist Judith Scott's work, *Untitled* (1989) (Fig. 3.2) shows the ability of threads to dissolve the surface. Scott uses twine and other threads to wrap commonplace objects, which she collects from the streets of Brooklyn, transforming them into obsessively bound sculptures. Through the process of covering the objects with thread, she is obscuring the inner structures, which in effect is dissolving the surface. As the surface of the object becomes concealed the surface of the object disappears, leaving line as thread. By threading lines onto fabric, the work begins as traces on a surface, but in activity with the needle the traces are translated into threads. In so doing, Scott has tried to make the surface of the fabric disappear. When we look at this work, we see lines as threads, not as traces, almost as though the substrate has been made transparent.

The way in which Scott juxtaposes colours and textures give this wall mounted sculpture movement and fluidity. The change in the rhythm and length of each linear thread creates movement on the surface of the object, alluding to what might be concealed behind the busy mass of three-dimensional lines. The shifts in the colour, and the change in direction and plane of the lines, map the undulating surface of the object. Scott has used thread lines to visually render and contour her object.

Like Scott I was able to use glass traces to dissolve surface. Through a series of blown objects, I explored the use of glass as traces becoming thread to dissolve surface. By winding hot trails of coloured glass around a glass form, made in the hot shop. (Fig. 3.3) The glass binds around the bubble dissolve and obscuring the surface. The glass thread is applied hot so it is malleable. Scott's work highlighted the power line can have in entirely dissolving a surface—building a new surface through absolutely obscuring the underlying surface. Within my own experiments, I noticed that as the work was inflated, small glimmers of the underlying surface started to emerge, becoming their own alternative marks too. Like Scott's work my lines also mapped the terrain under the surface—as the glass substrate moved so did the surface lines.

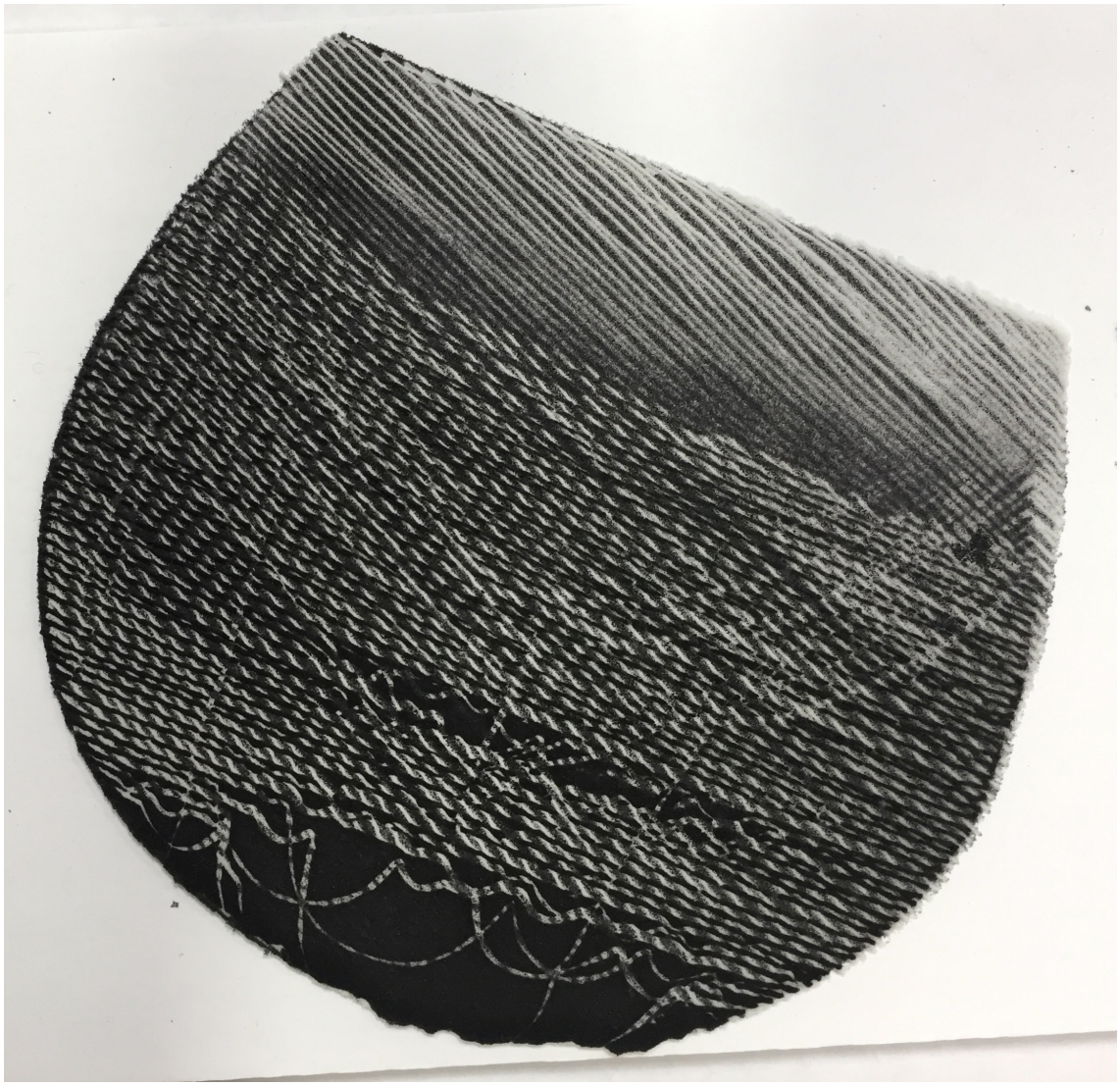


Fig. 3.1 Mel Douglas, *Studio exploration (transforming threads into traces) #14* 2015, glass, 25 x 25cm.

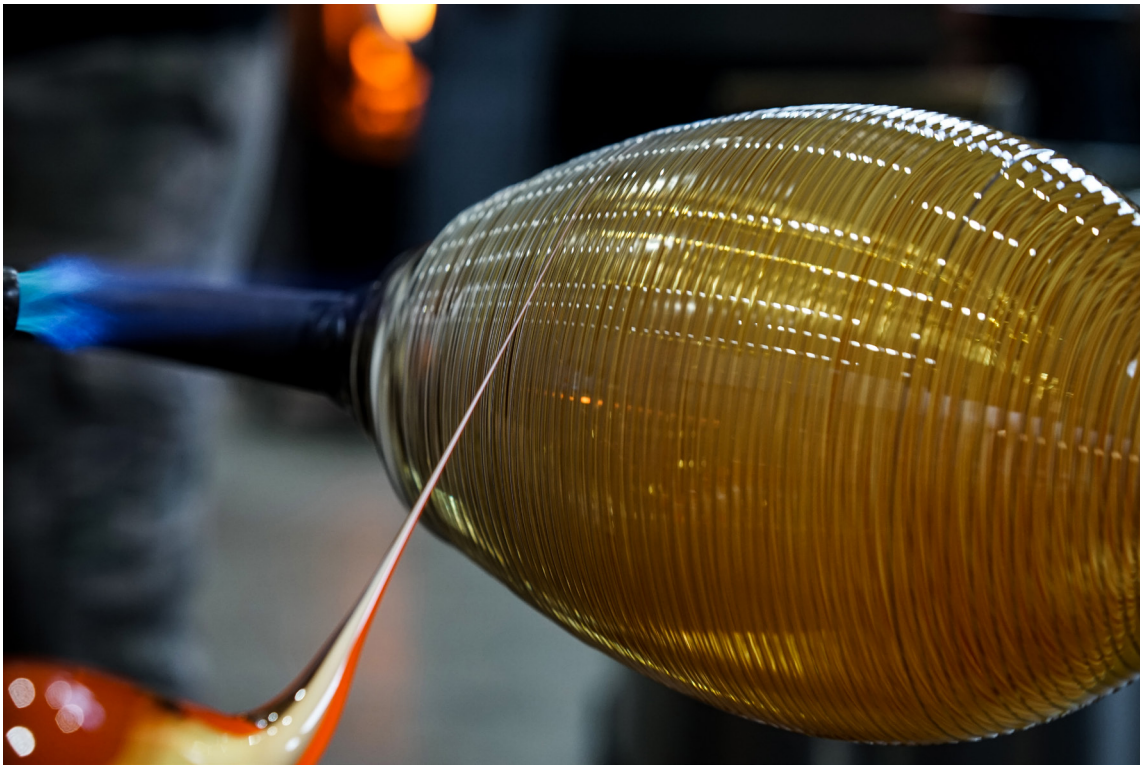


Fig. 3.2 Judith Scott, *Untitled* 1989, fibre and found objects, 94 x 86 x 12.7cm. © Creative GrowthArts Centre, Oakland ,California, USA. Photo: Benjamin Blackwell.

Fig. 3.3 Mel Douglas, Detail of glass being trailed onto the surface of a bubble for *Studio exploration #15* in the Canberra Glassworks hot shop, line dissolving surface. Photo: Louis Grant.

Fig. 3.4 Mel Douglas, *wove.wrap.weave* 2016, from the series *Mapping*, blown, coldworked and engraved glass, 30 x 65 x 30cm. Photo: David Paterson.

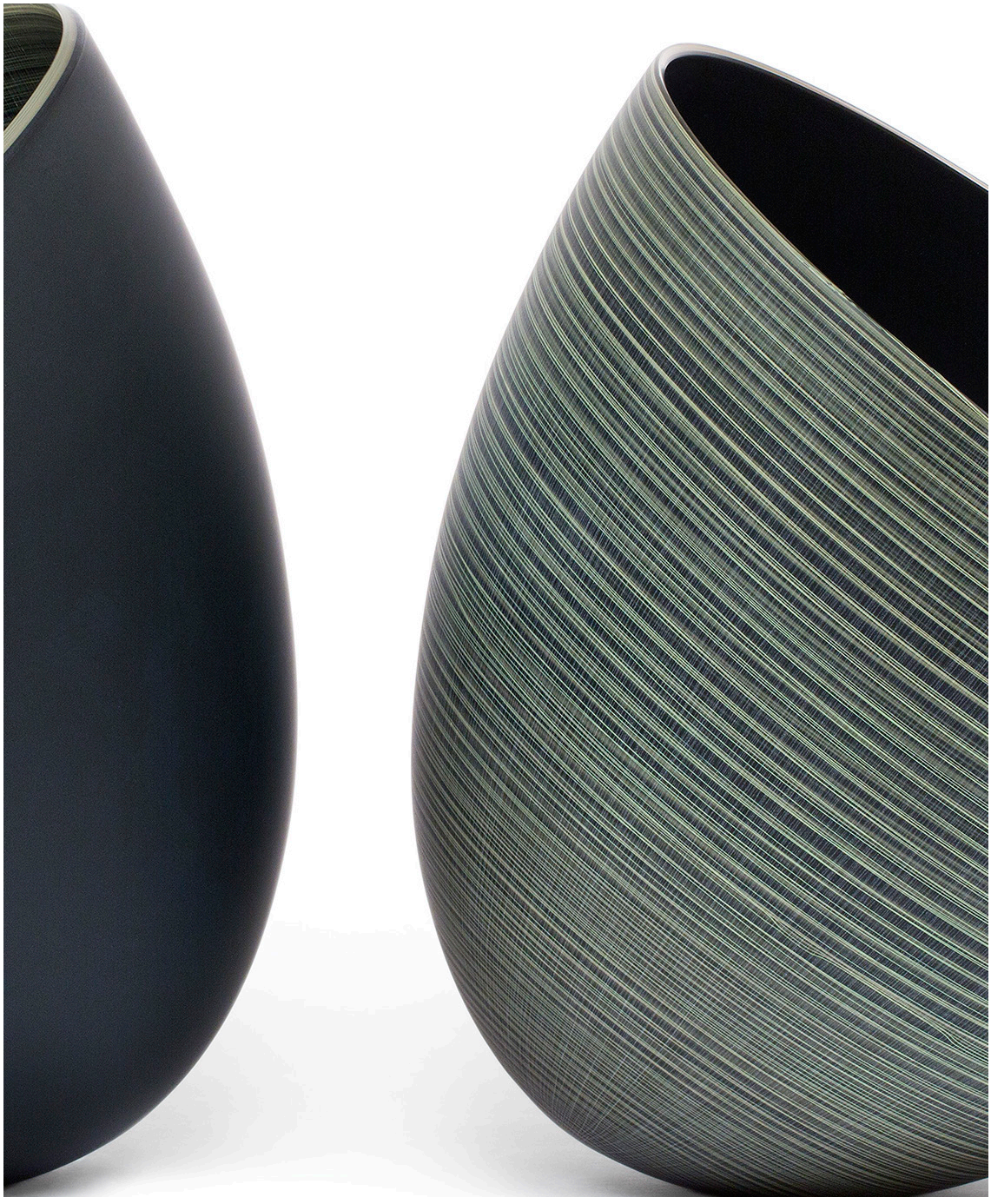


Fig. 3.5 Mel Douglas, *wove.wrap.weave* 2016 (detail), blown, coldworked and engraved glass, 30 x 65 x 30cm. Photo: David Paterson.

This material test allowed me to map the outer or interior surface of objects through the use of trailed contour glass lines. As the glass traces became interlaced, they started to become the fabric of the object, building a new surface on top of the substrate. By applying continuous strands of lines, they dissolved the surface and became threads on the surface. (Figs. 3.4 and 3.5)

By considering my experiments in context of the work of Scott and Lou, I understood that both methods of Ingold's notion of the transformative properties of line have application when working with the material of glass. Through the exploration of each idea of transformation I was able to experiment with glass lines and their relationship to surface. This investigation also made me reconsider the transformation or dissolution of surface that occurs when making marks on and with glass. I started to see that through the relationship of line and surface glass had the ability to taking a journey of interiority, suspending lines within molten glass. By layering and using line as a connective tissue, I had explored new ways to move from the surface, through the body and into the interior space of glass through line. I was able to trace the space of the form through lines moving through the surfaces of glass.

This idea of a connective tissue between interior and exterior surfaces was for me further supported by examples and text included in the exhibition catalogue, *The Glass Skin*. Co-curator of the exhibition Helmut Rickie wrote:

> Like the human skin, the skin of glass is not only a surface, it is also a wrap. There is an inside, an outside, an underneath, and an in front of. The skin is a boundary where everything comes together; it is the narrow dividing line between inside and outside, where everything is concentrated. Only here do expression and meaning achieve their full intensity. The wrap can hide the interior or—and this is only something glass can do—emphasize that interior and make it transparent. The outside can be rejected or included. Both corporeality and the relation to space are defined through the boundary of the skin.[43]

Rickie observes the relationship of surface, glass and line, discussing transparency, one of the key properties of glass. He states that transparency enables and activates the interior of the substrate as another surface. Until I started this research, I had only worked with opaque glass. I could now see that considering the use of transparent or translucent glasses would offer a way to connect line and surface, which is unique to the material of glass. The interior space can be connected to the exterior through transparency and translucency. Another

43 Helmut Ricke, *Glass art: reflecting the centuries*, 2002, Munich, Bering, London and New York: Prestel Verlag. p12.

material quality glass offered is that lines on a clear substrate have the ability to move through a material, to move beyond the surface, to move within the body of the object. Through the use of transparent and translucent glasses objects have a connective surface between the outside and inside.

My material tests allowed me to experiment and explore the notion of transforming threads into traces thus bringing new surfaces into being. Exploring the notion of line building surface, I interlaced threads of glass building a surface, transforming the glass threads into traces on the surface. By exploring the connection of line and surface, and the ability of different types of line to change or transform a surface, I was able to consider and use new ways of constructing surface or dissolving surface through using line. This research also provided me with new ways of observing and understanding what physical changes occur on surfaces through the act of applying lines. Through studio exploration, my material tests identified the following material qualities of glass (transparency, translucency, malleability) and recognised the multitude of forms that glass lines can take, either as a thread or a trace, providing distinctive ways to explore the relationship between line and surface.

Through my studio research both into line and the connection between line and surface, I identified the unique ways in which glass is able to transform line in relation to surface. The next chapter identifies three additional categories of lines I developed, which sit outside Ingold's taxonomy. These new categories are: line as structure, line as space and light lines. These new categories are discussed and supported visually by examples of my own work, and those of artists in other media.

Chapter 4: Lines beyond the boundary

The next stage of my research was based on my initial observations and investigations and allowed me to identify new types of line that sat outside Ingold's categories. These new categories became the driving force behind my final body of research, which is considered in Chapter 6. The following new categories of line allowed me to use glass in distinctive ways to explore the relationship of line to three-dimensional space and surface. It also allowed me to develop objects, in both two and three dimensions that spatially merge surface and drawing, where the form is not a canvas but a three-dimensional drawing in itself.

The development of my material investigations along with my *Line Map* confirmed that many areas of line making fall between Ingold's classifications. As discussed previously, and as noted by Ingold, many artworks and modes of line making do not fit neatly into his proposed taxonomy. On occasions the use of glass for each classification proved challenging. However, some difficult moments proved to be extremely useful, leading me to explore and investigate ways of line making that I wouldn't have otherwise tested.

Through the interrogation of line and surface in my material experiments I have identified three additional categories of lines: line as structure, line as space and light lines. In the following paragraphs I provide definitions for each new category, supported visually by works of art. I discuss the general application and usability of glass as a means of line making in each section followed by an overview of my own material tests which support these new categories. I also discuss how and why glass used as these types of lines is particularly distinctive.

Line as structure

The proposal I tested through studio research was that the junction, connection or joining of two materials into one homogenous body or form creates line as a structural element. This meeting of two substrates creates a category of line joined either through the application of heat or an adhesive that bonds all of the elements together. These junction lines become the linear make up the work similar to a skeletal system. Side by side the junctions become the fabric of the object, like a weaving. The lines do not sit on the surface as an additive or reductive trace. They are embedded within the body of the substrate. The following works show the use line as structure, as both an aesthetic element, as well as an integral part in their construction.

Leaf Platter (1951) by Finnish designer Tapio Wirkkala is an example of the use of line as structure. (Fig. 4.0) *Leaf Platter* demonstrates how a three-dimensional medium can be transformed into a drawing material to explore space and form. Constructed from multiple layers of birch which are glued together in a process called lamination, the laminated sheets are stacked and glued into a large solid block. Each layer of birch has been hand selected by Wirkkala who intentionally varies the thickness of each sheet, as well as the depth of each lamination join. The use of irregular materials gives the work a soft, natural rhythm. The block is then cut into layers and the leaf hand-carved from a single layer. As Wirkkala removes material to reveal the form the laminations become lines of structure. The object's linear structure curves outwards towards the tip, from the raised bisecting vein. The lamination lines trace the object's every move; the thin veneers of birch map every dip, swell and curve.

Wirkkala's *Leaf Platter* (1951) uses negative space, the space between this material (lamination) to create a sense of depth and a 'space that laid beyond' or within. The lamination lines are voids which draw the viewer into the core of the object. They reveal its internal structure marking the 'participation of external space in the internal composition of a surface.'[44] *Leaf Platter* is composed of line, lines that three dimensionally map the form. This linear structure of the leaf penetrates the form, exploring the typography of the object. Using reductive simplicity, Wirkkala has harnessed repetition and the rhythm of the material to pay homage to the idiosyncrasies of nature. While this work has a great sense of movement, it also has an austere sense of stillness and calm that the artist was able to capture and distil. Wirkkala has carved and shaped *Leaf platter* so it hovers above the surface that it sits on; the thin edges give the object an appearance of weightlessness.

Wirkkala uses what I have termed 'line as structure' as a structural determinant of the work, directing the form. The lines lead the eye through and across the work, the spaces between each layer shape and control the overall shape of the object. I also looked for examples of this structural line by artists using glass. Jiyong Lee's *White Cuboid Segmentation* (2013) (Fig. 4.1) was a key example. This work is inspired by his interest in the science of cells. Working with both the transparency and translucency of glass, two qualities that serve as perfect metaphors for cell transformation, Lee transforms solid blocks of glass using techniques of cutting, lamination and carving to make his solid cells of structural lines.

Through the process of cutting, grinding and then re-laminating pieces of his solid blocks back together, Lee is creating lines of structure within a body of glass. The structural lines create small transparent three-dimensional windows within the work framed by the

44 Rye Dag Holmboe, Review: 'The Abandonment of Art' Lygia Clark at MoMA, New York.' *Apollo*, July 9 2014. URL: http://www.apollo-magazine.com/review-abandonment-art-lygia-clark-moma-new-york/ (accessed on 4/5/2015).

Fig. 4.0 Tapio Wirkkala, *Leaf Platter* limited production 1951 and 1954, laminated birch, 3 x 24.5 x 48.5cm. Collection: National Gallery of Australia, Canberra.

Fig. 4.1 Jiyong Lee, *White Cuboid Segmentation, Option 2* 2013, cut, colour laminated, carved glass, 20 x 25 x 12cm. Collection: The Corning Museum of Glass, Corning, USA.

translucent adhesive veils. Each framed window is reminiscent of the way cells split and divide. The structural lines and the transparency of the glass allow you to see inside the object, like looking at cells through a microscope. The translucency allows us to see the connective elements and the relationship between the connective structures, line and surface. The structural lines run horizontally through the work. They do no hover on the surface, they penetrate through the form creating modular areas that together form the outer structure of the cube. *White Cuboid Segmentation* (2013) shows the appropriateness of using glass for line as structure. Highlighting the unique qualities, the material, transparency and translucency, as a means for line making. Lee's work illustrates a dynamic connection between line, surface and its ability to explore multi-dimensional space.

After close analysis of these two works it became apparent that glass offered unique qualities that could be used as a means to explore structural lines, in a way that is not possible with other mediums. By experimenting with joining segments or fragments of glass using both adhesives and kiln forming, I was able to harness the unique qualities of glass to explore how glass line can be used as a drawing medium to express multi-dimensional space. Exploring line as structure refocused my attention on the most innate properties of glass, properties that I am so familiar with I often overlook. It gave me the opportunity to mine these distinctive properties, as a means of connecting line with surface to explore space and form. I experimented widely and freely, allowing the material to reveal why it is such an appropriate medium for my practice-led research. The following sections discuss some of my experimentation and outcomes.

One commonly used glass in contemporary studio practice is Bullseye sheet glass. All of Bullseyes sheet glass is handmade, in a factory in Portland Oregon, USA. One of the notable aspects of this glass is that every sheet is unique. This is an appealing characteristic as it means that each junction will be different, like any hand drawn line. In *Studio exploration #16* (Fig. 4.2) I used a single colour of sheet glass, cut, stacked and fused using heat in the kiln. The chemical composition of this glass leads to variances in the colour and density throughout the sheet. The light blue lines you can see are the linear marks of the junction between the two bodies of glass.

What I found most compelling about this experiment was the way glass changes as it is constructed and fused together, leaving structural lines that map the object. Each structural line is slightly different, as if it were hand drawn, as all of the sheets are handmade and there are variances within the thickness of each piece of glass. The colour of the junction is interesting, it always seems to be a darker tonal variation of the sheet—the junction lines themselves have threads of tonal variations which run through them.

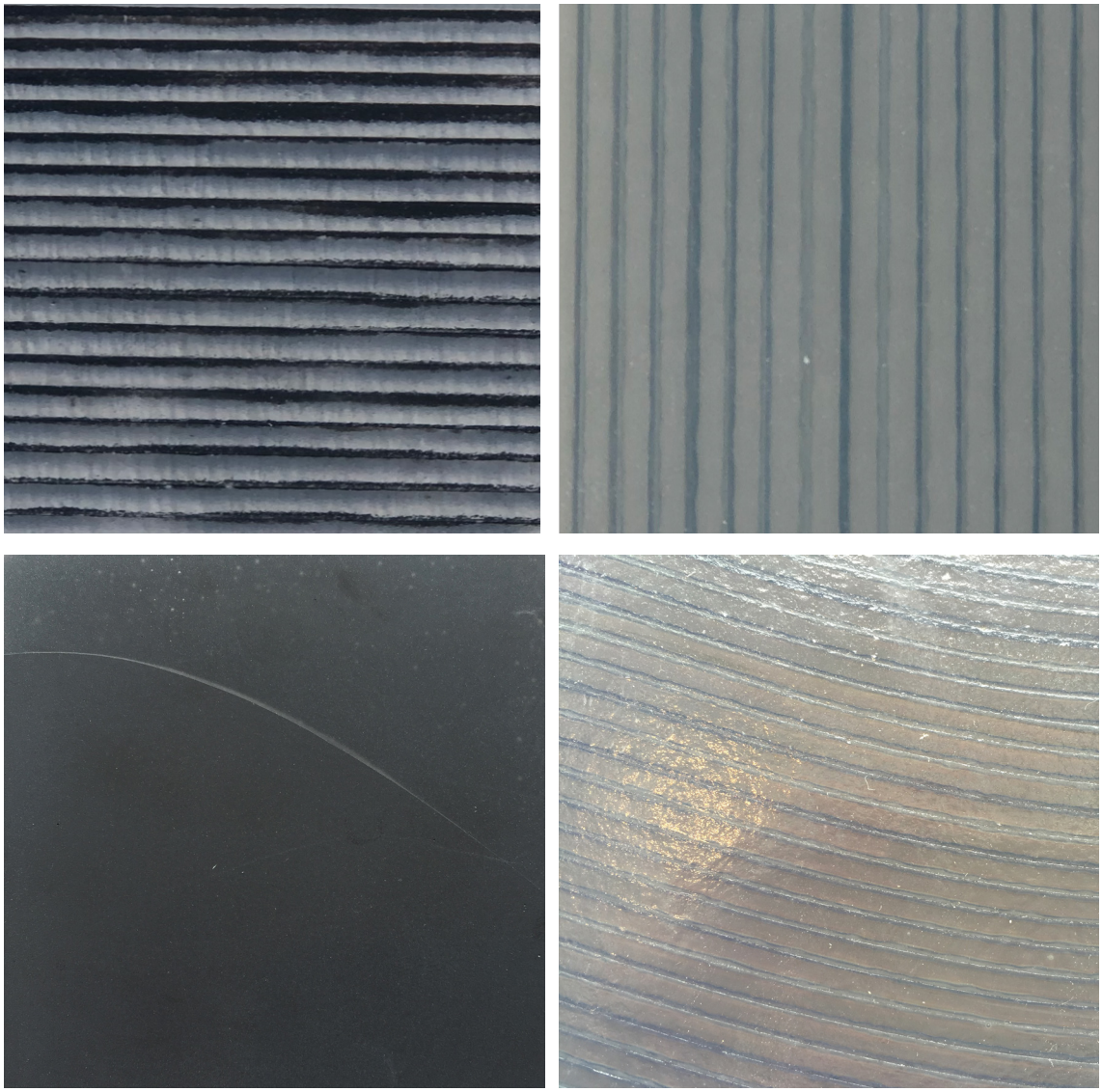


Fig. 4.2 a–d Mel Douglas, *Studio exploration #16* 2015 ,(detail) kiln formed and coldworked glass, dimensions variable.

The junction or meeting of the space between two substrates led me to further experiment with glass as a constructed line as a means to build and explore three-dimensional form. Like Wirkkala's *Leaf Platter* my explorations have highlighted how a constructed line is a line which penetrates the entire mass of an object, like a three-dimensional map. To expand my understanding of the material properties of glass I have combined transparent and opaque glasses, so that the lines of light enable the viewer to penetrate or see within the material. I also explored the possibility of layering other materials such as powders and enamels between each layer to further define the quality of the line, allowing light into the material. Further development of this type of line is discussed in later chapters. Another aspect of this type of connecting line in glass—is that it is not relying on any adhesives or additional materials to show the connection of the materials. It is simply one of the innate properties of sheet glass that allows it to be stacked and fused (using heat and gravity) into a constructed line.

Line as space or an interstices

The second area that sits outside Ingold's classification is line as space or interstices. Although this category is closely related to reductive threads and cuts, I propose it as an additional category of line, as it does differ from those aforementioned. It is not made through cutting, removing or added anything to a substrate. Line as space exists through two solid lines framing a linear space or an interval in a solid line. Line as space or interstices is a negative linear space that sits between two pieces of material to create a new line. The space line is an active element within the work. Artist Gego wrote about her work, *UN Trabajo Meditativo*:

> I discovered the charm of the line in and of itself—the line in space as well as the drawn line on a surface, and the nothing between lines and the sparkling when they cross, when they are interrupted, when they are of different colours or different types. I discovered that sometimes the in-between lines is as important as the line by itself.[45]

Like Gego, through an intensive exploration in line, I began to notice how important the space between and around line is, and how the space becomes a completely independent set of lines. As made evident in my material test (Figs. 4.2 and 4.3) the interstices are as important as the lines themselves. Line in space starts to demarcate nothingness into an outline, giving the space a shape. As can been seen in my exploration this type of line occurs when two parallel lines are drawn, one next to the other, they demarcate the space in between, making a new line, a space line.

45 Gego, 'Testimony 4: you invited me.' In *Sabiduras and other texts : writings by Gego*, edited by Maria Elena Huizi and Josephina Manrique Cabrera, 2005, p167. Houston: International Centre for the arts of the Americas, and Caracas: Foundation Gego.

Fig. 4.3 Mel Douglas, *Studio exploration (engraving as interstices) #17* (detail), blown, coldworked and engraved glass, 40 x 40 x 40cm. Collection: Powerhouse Museum, Sydney.

American artist Richard Tuttle used space lines within his work and stated that 'The paper is just as much drawn as mark is drawing'.[46] Through the action of laying down lines, with linear space in between, the substrate is activated and becomes an additional type of line. This can be achieved also when working with a range of three-dimensional materials– the space between lines becomes activated by the lines around it.

The work of Cuban-American Carmen Herrera, in particular her three-dimensional work *Amarillo Dos* (1971) (Fig. 4.4) also uses the negative space between two linear blocks to create a third linear element. The two tangible elements in her bold architectural structure frame the space in the centre of the work, into an elongated triangular line. At both top and bottom corners the abstract geometric forms open up, releasing the line into space in the form of two open-ended triangular lines.

It is the interstices between these two linear forms that creates a space line. The negative space is activated by the solid yellow frame. This example shows clearly and boldly what a space line is and how it can be used to demarcate or create new space.

Stanislav Libensky and Jaroslava Brychtova are well-known artists within the field of studio glass. They have continually pushed the limits of glass as an architectural and sculptural medium. They use both light and space to delineate form. These large-scale, three-part works use space as line. The hollow cast glass shells of *Imprint of an Angel I and II* (1998–99) use both the void and space within the surface to create lines as interstices. This line of space dissects the forms by carving a linear space from the top to the bottom of each of the domes. The space lines become a window into the work, allowing light to flood into the space line. Similarly, as with Herrera's work, the line is activated and outlined by the solid material, the two linear planes that run along each side of the void become a border. (Fig. 4.5)

This line also plays another important role in the work: it creates a connective surface from the interior to the exterior. Without the space line this work would have a clearly defined interior and exterior. The space between becomes a window through which the viewer is allowed to go within the work to experience the volume of the internal spaces. The space line leads you into the work.

The examples discussed above illustrate how voids can become lines of space by framing space with solid linear structures. While Herrera's work confidently outlines the space in yellow, her solid colour L-shaped lines brashly crate clearly marked out space. In contrast Libensky and Brychtova large scale works harness and use light lines to shape space into a multi-dimensional space. Their work uses the translucency and transparency of glass as a means

46 Richard Tuttle quoted in Butler, *On line*, p119

Fig. 4.4 Carmen Herrera, *Amarillo Dos* 1971, steel and paint, 56 x 58 x 12cm. Photo: Carmen Herrera.

Fig. 4.5 Stanislav Libensky and Jaroslava Brychtova with *Imprint of an Angel I and II* 1998–99, cast glass, 233.7 x 110.5 x 43.2cm. Collection: Museum of Fine Arts, Houston, USA.

of creating a light-filled void. The space line opens up the surface to let the light pour in and occupy the space. Both examples above highlighted the potential for using space lines as a means to explore space within my practice-led investigations.

Light lines

The third new category of line I have added to Ingold's taxonomy is light lines. This category can be any type of line that is created by a shaft or a gap between two materials or line created through light. Sometimes this type of light happens naturally, for example as a light shaft filtering in through a windowpane, creating a line of light across the floor. Alternatively, light lines can be directed through gaps in surfaces, or they can penetrate through translucent areas in a surface, they can also be in the form of a shadow, like Bronwyn Oliver's *Comet*.

The work of Architect John Pawson used light to outline and establish space. Pawson is known for his rigorous process of reduction, creating designs of simplicity, grace and visual clarity. In *Plain Space* (2010) (Fig. 4.6), he has used lines of light in two different ways. The image on the right demonstrates the luminosity of darkness. By darkening the physical space and directing light along the linear planes of the door frame, Pawson transforms the frame into a gleaming rectangular line of light. The image on the left again uses light to make line to define his space. Again, he has darkened the front of the room and diffused the light in the back, angling the light so that it catches the edges of the arched doorway, outlining the shape with lights, so that light is hovering on the seams of where one room leads to the next.

By exploiting the transparency and translucency of glass I was able to explore the ways in which I could incorporate line into my studio practice that allowed light to pass or filter through the material as a light line. Light lines enabled me to capture the three-dimensional depth of the substrate alluding to a space beyond the surface. While the lines do have a surface, the translucency allows the line to penetrate into the material. (Fig. 4.7)

The space of this studio experiment is defined by light—the contrast between light and solid, transparent and translucent. The light enters from the front through a thin light line in the grey glass panel that extends vertically from top to bottom. At the intersection of light and solid I became aware of the division between the two materials. Using the negative space and the space between two physical masses of glass, I used a line of transparent gold to create a light line. The translucency of the material enables a hue of colour to float behind the light line that slowly seeps into the grey.

Discovering ways to draw with light, exploring the physical space of glass, was a turning point for my research. By layering thin transparent or translucent layers of glass on top of

Fig.4.6 John Pawson, *Plain Space* 2010, installation, Design Museum, London, UK.

one another, I was able to include new spatial lines within my explorations. This layering also allowed me to change the chroma, value and hue of a colour and the texture of a surface. It enabled me to define three-dimensional space.

Through the *Line Map* and comparative classifications of line, along with my own material explorations, I was able to observe the unique qualities and possibilities of line-making with and on glass, and its relationship to surface to explore space. By focusing on the utility and potential of glass as a means for line making, under the initial structure of Ingold's taxonomy, this chapter identified three additional categories of lines, which sit outside Ingold's taxonomy. These new categories are: line as structure, line as space and light lines. All of these new categories, and ways of utilising line, were explored comprehensively in my final body of research which is discussed in Chapter 6.

Through the development of my *Line Map*—which led to my cross-comparative analysis of line and surface and material tests—I established what line was, what relationships exist between line and surface, i.e. how lines can build or dissolve a surface. And lastly, I considered what were the distinctive material qualities of glass, as a line making material or substrate that offered new ways to use line. I needed to focus on the connection of line to surface. One of the most important things I had learnt from my study of line was that focusing on the interaction and connection between line and surface was a way to map and define space. The following chapter looks at the connection between line and surface. And how by using glass as a drawing material and as a substrate I was able to explore new ways of drawing and new ways of defining and exploring space through the use of geometry.

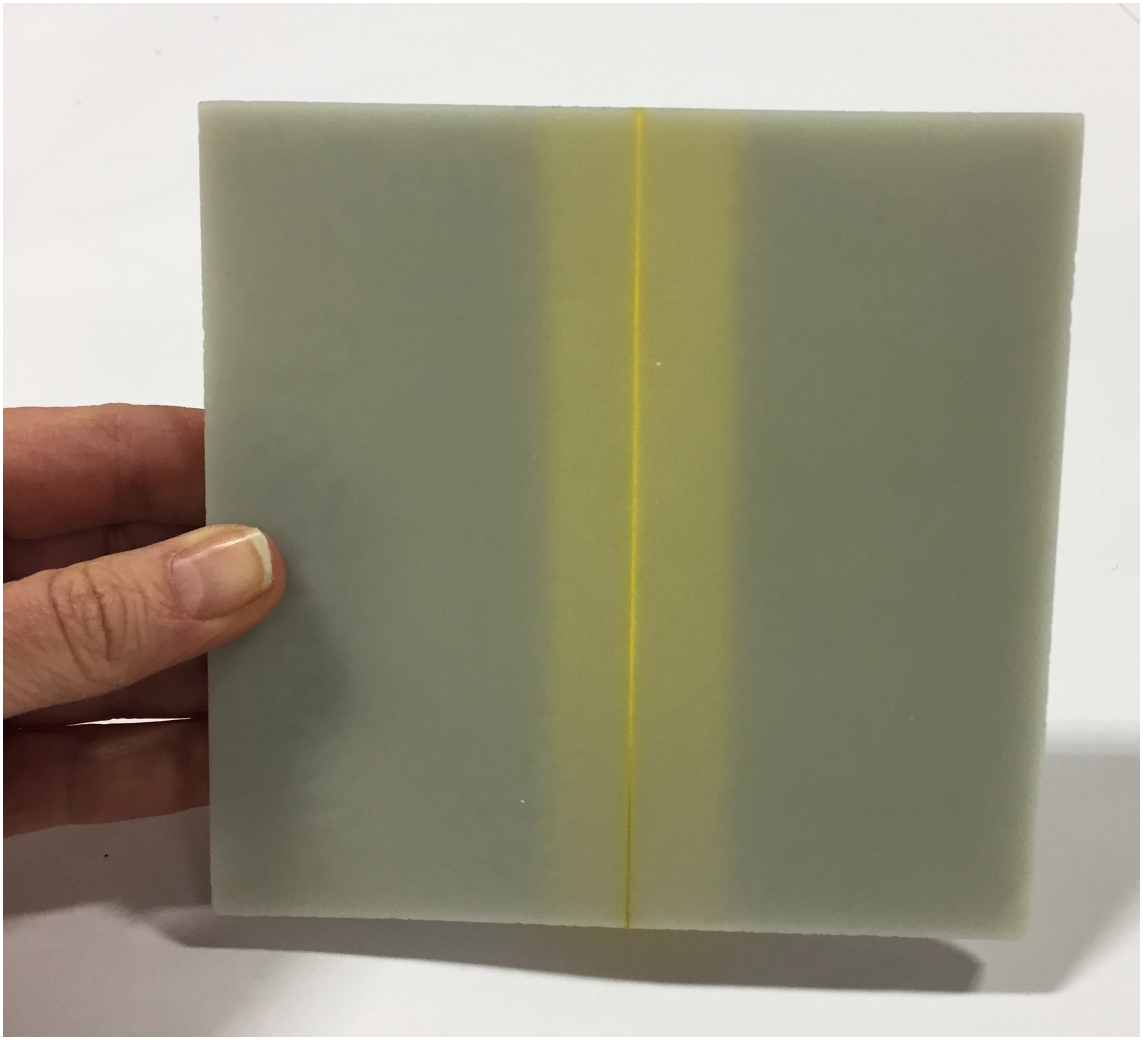


Fig. 4.7 Mel Douglas, *Studio exploration (light lines) #18* 2015, kiln formed and coldworked glass, 15 x 15 x 5cm.

Section Two—Line Extension

Chapter 5: Linear perspective

This chapter maps the next period of my research, up to this point I had established and experimented with line and surface and explored the use of glass to create new relationships between the two. By applying theories on line, looking at historical developments and precedents from drawing in the 20th and 21st centuries, through the analysis of relevant works in various mediums, and finally through my studio research material tests, the new categories of line I had identified, in addition to Ingold's taxonomy. However, I had one more facet to explore—using the drawn line and surface to explore space.

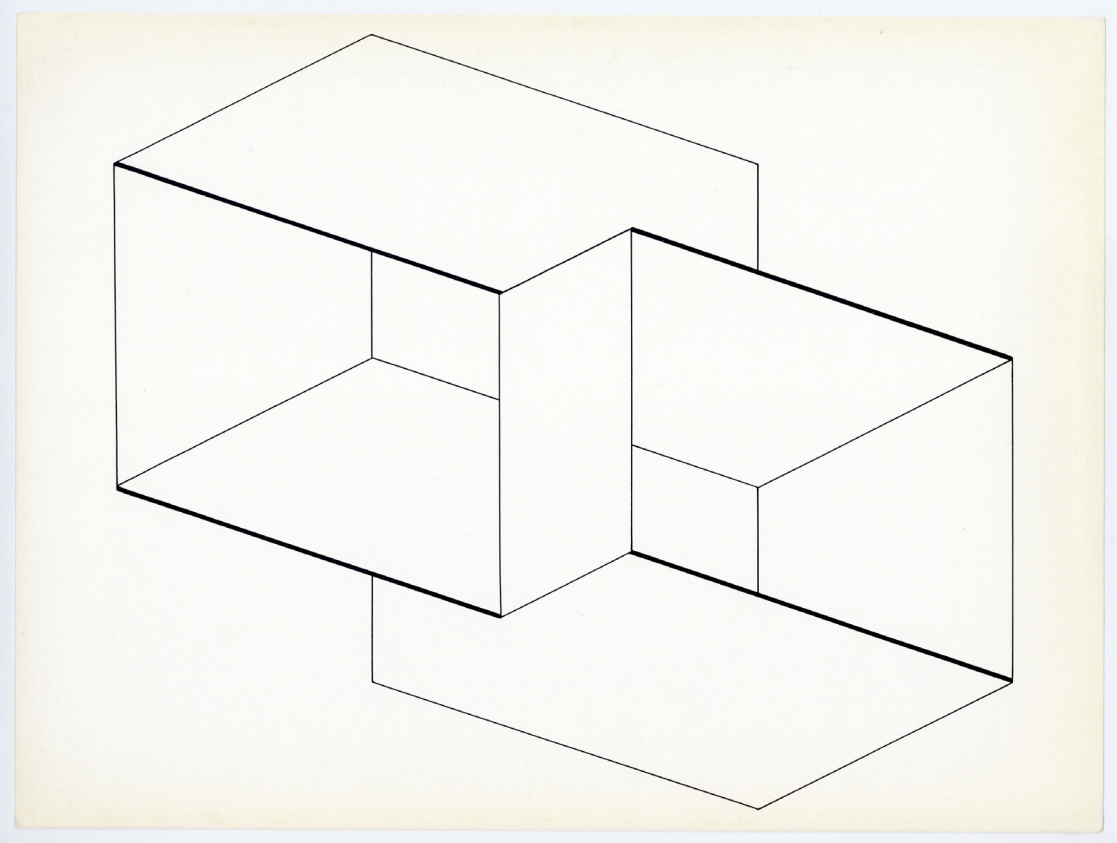
Field work provided me with the opportunity to do so, through an examination of geometry and ways of creating space, which culminated in both a theoretical enquiry as well as a focused practice-led residency at the Bullseye Glass Factory in Portland, USA. This enquiry led me across the United States of America to view collections, exhibitions, visit artists' studios, and attend an international craft conference. As my project progressed, I began to see parallels with the study of geometry itself. They both start at a single point, branch to lines, and then into two and three dimensions. I have broken down my field research into four elements: geometry, visual references, dialogue, and residency.

Geometry

Geometry has always played a role within my work, but has come from an intuitive place rather than through the examination and application of mathematics. As my research progressed, I started to see that many of the works I had referenced in my Line Map shared common patterns and mathematical influences. I could see similarities in proportion between parts, shape, size and relative positions of lines. It was after spending an afternoon viewing Joseph Albers' work *Structural Constellation* (1954) (Fig. 5.0) in New York and analysing how he implied dimension through the use of linear perspective, that I knew I needed to understand the basics of geometry and to apply some of the theories to my work in organising space.

I started by reading Wassily Kandinsky's, *Point and Line to Plane*,[47] Albert Flocon and Andre Barre's *Curvilinear Perspectives* and *Form,*[48] *Space and Vision*,[49] by Graham Collier, through

47 Wassily Kandinsky, *Point and Line to Plane*, 1926, Dessau: Bauhaus Books.
48 André Barre and Albert Flocon, *Curvilinear perspective: from visual space to the constructed image*, 1987, Translated from French by Robert Hansen. Berkeley: University of California Press.
49 Graham Collier, *Form, Space and Vision: An Introduction to Drawing and Design*, 1984, New Jersey: Prentice Hall.



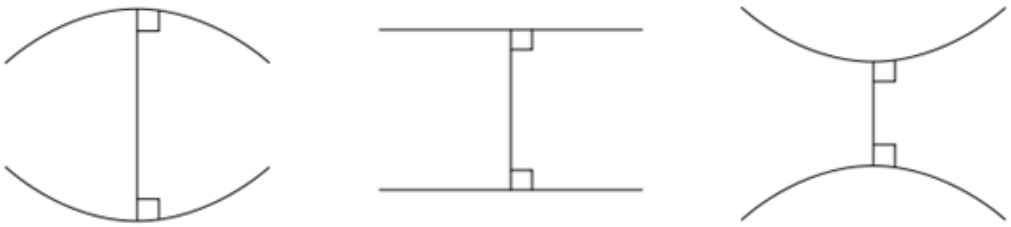


Fig. 5.0 Joseph Albers, *Structural Constellation "To Ferdinand Hodler"* 1954, incised vinyl acetate resin on wood, 43.3 x 57.2cm. Collection: The Riklis Collection of McCrory Corporation, 985.1983, Museum of Modern Art, New York, USA.

Fig. 5.1 In elliptical space, the lines curve towards each other, with a positive constant curvature. In Euclidean space, the lines remain at a constant distance from one another even when extended into infinity. In hyperbolic geometry the lines curve away, increasing in distance as we move away from the third line.

which I familiarised myself with the basics of Euclidian and non-Euclidian geometry. I could see areas in which I had intuitively started to apply some of the geometric theories and ways of exploring space. These resources emphasised new ways to think about the relationship between glass, line, surface and space through the use and intent of line in relationship to surface and space. They gave me solid rules and means to explore new spatial relationships. These resources began to clarify the complexity of spatial relationships within glass practice and highlighted some of the fundamental concepts in mathematics that I recognised within my practical research. Some of these ideas are evident in the body of research I will talk about in Chapter 6.

My research sought to understand, incorporate and illustrate some of the fundamental concepts of geometry and mathematics used to organise the arrangement of space and line on a surface. This research assisted in the visualisation and understanding that occurs on the surface of a form, when it moves or is transformed between two and three dimensions. By employing drawing and line to map these changes I was able to develop ways of representing this transformation and new ways of subverting surfaces through the use of line to define space. By employing Euclidian and non-Euclidian geometry, alternative speculations posed by Kandinsky, Flocon and Barre, and Collier I explored a wider spectrum of line to express space. These references provided ways for me to give line purpose and connection to defining surface and space. These concepts became important and were referenced when working in the studio during my final research.

The following sections provide summaries of these references in my own terms. I look at how I employed and interpreted these ideas, and how these concepts assisted my research to find innovative ways to use glass as a drawing material to explore space and form. This data was then tested and used in the studio through my final body of practice-led research.

Euclidean geometry is the geometry we are most familiar with. Named after Euclid, a Greek mathematician who lived in 300 BC, his book *The Elements* is a collection of axioms, theorems and proofs about squares, circles, acute angles, isosceles triangles, etc. Euclidean geometry sets the parallel postulate proposing that: given a line, Line A, and a point in space not on that line, there is only one possible other line, Line B, that can be drawn through the point and remain parallel to Line A.

Non-Euclidean geometry has two possible scenarios—that of elliptical or spherical space, and that of hyperbolic space. Elliptical geometry takes the flat planes imagined by Euclid and replaces them with the regular curves of a sphere. The parallel postulate under these conditions suggests that given Line A, and a point in space is not on Line A, there are no

possible other lines that can be drawn that pass through the point and remain parallel to Line A. In hyperbolic geometry, there are an infinite number of lines that can be drawn through the point and remain parallel to Line A. Non-Euclidean geometry is the field of mathematics which finds ways to conceptualise space other than those described in Euclid's parallel postulate. [50]

As my work moved between varying surfaces, flat, concave, convex and spherical, my lines therefore vary too. By becoming familiar with the fundamentals of these three types of geometry, I applied these formulas to create varying perspectives with lines, to map and develop new surfaces with the use of line and to divide, partition segment and articulate new space on surfaces. Illustrated in Fig. 5.1 is a simple line drawing that elucidates what each type of geometric line does. This is shown simply by studying two lines perpendicular to a third line.

In elliptical space, the lines curve towards each other, with a positive constant curvature. In Euclidean space, the lines remain at a constant distance from one another even when extended into infinity. In hyperbolic geometry the lines curve away, increasing in distance as we move away from the third line.

The practice-led research that is discussed in Chapter 6 incorporated these concepts of geometry and space, Euclidean space, elliptical and hyperbolic. Geometry was employed for simple divisions of space, finding the distance between two spaces in both flat and curved surfaces. I explored overlapping, size differences and new vertical placements to create a sense of space within my studio explorations. Geometry gave me direction and guidance to articulate space, to curve what was flat and to flatten what was curved. In particular, my series of work Inscribing, employs the use of line on the surface to bend flat planes into folds. The series Rendering uses both elliptic and hyperbolic space to define and suggest new spatial dimensions. Along with using these areas of geometry I looked to artists that had both written and utilised geometry and line within their practice, the first being Russian artist Wassily Kandinsky.

Kandinsky's *Point and Line to Plane* is a resource that I've treasured and used as a reference over the last twenty-five years. Although it has been buried away in my bookshelf for a long time, I was delighted when it retuned to my orbit. *Point and Line to Plane* explores the interrelation between colour, form, line direction and intensity of the point to create an aesthetic experience. One of the most enlightening and engaging aspects of this book is how Kandinsky uses and discusses his use of line. The way he refers to the influence of the force of

50 L. Dalrymple Henderson, 'Fourth Dimension and Non-Euclidean Geometry in Modern Art: conclusion,' in *Leonardo*, vol. 17, no 3, 1984, p205

line, it's lyric and dramatic qualities, and the translation of various phenomena into forms of linear expression.

> Smooth, jagged, torn, rounded are attributes which in the imagination create certain sensations of touch, due to which the outer borders of a line, from a purely practical point of view, should not be underestimated. With the line, the combination possibilities in the transference to touch sensations are far more many-sided than with the point: for example, smooth edges of a jagged line; jagged edges of a smooth, rounded line; torn edges of a jagged line; torn edges of a rounded line; etc. All of these characteristics can be used in the three types of lines—straight, angular and curved—and each of the two sides can have a special treatment.[51]

Kandinsky points out the organic relationship between composition, the role of texture and time. (Fig. 5.2)

Many of the ideas about line that Kandinsky raises, changed the way I used line in my practice-led research. This publication reintroduced me to the many personalities and adventures that line can take. Kandinsky delves into the intent of each mark and the relationships between form and mark making. Rereading this book, I began to experiment with changes in the tempo and tonality of my lines. Thinking of my lines and marks more as a visual language for contextual storytelling relating to surface. My lines in collaboration with their surfaces suggested angles, collision, composition, contrast, planes, points, purpose, structure, tension, texture, time and weight. Evidence of the influence of the writing and ideas of Kandinsky are highlighted in the series *Rendering* (2015–2019) and *Mapping* (2015–2019).

Following this I began studying the work of Dutch artist Maurits Cornelis Escher. I was most interested in the way Escher used his knowledge of geometry to playfully explore errors in perspective, developing new spaces which are almost, if not absolutely, impossible. I drew correlations with how I was attempting to use geometry. Although my methods were much less defined and exacting, I applied what I knew and made changes to challenge existing knowledge. Escher often refers to how important mathematics and geometry have been to ordering his constructions, he wrote: 'Mathematicians have opened the gate leading to an extensive domain.'[52]

Through analysis of Escher's work I was led to another key reference. In the catalogue, *MC Esher's Legacy: A Centennial Celebration* Escher talks about curvilinear perspective, and his

51 Kandinsky, p91.
52 National Gallery of Victoria. 'Escher X Nando: Between Two Worlds.' URL: https://www.ngv.vic.gov.au/exhibition/escher-x-nendo-between-two-worlds/ (accessed 7/2/2019).

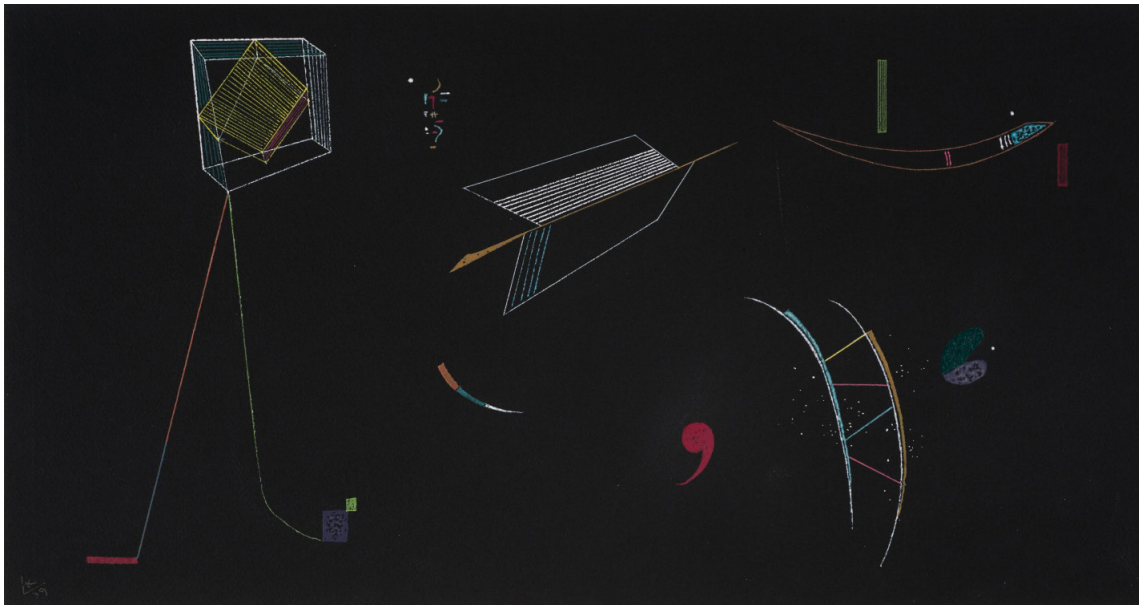


Fig. 5.2 Wassily Kandinsky, *Lines* 1939, watercolour and tempera on black paper. 40 x 50cm. Photo: Courtesy of the Jill Newhouse Gallery, New York, USA.

friendship with the co-author, art historian and artist Albert Flocan.[53] *Curvilinear perspectives: From visual space to the constructed* by Barre and Flocon also opened new territory for my practice. By thinking of flat surfaces as three-dimensional objects allowed me to take my two-dimensional work, and through the use of line, render it into a new volume. This insight, along with *Form, Space and Vision*, allowed me to start exploring the liminal space that exists between two and three dimensions. I used line in the way that we actually see it, receding into space, in all directions. Through the application of this curvilinear perspective, I was able to animate flat surfaces into spatial volumes. (Fig 5.3)

Barre and Flocon begin by discussing traditional rules of perspective which use vanishing points and straight lines, and then proceed to define their own system of measurement. The system uses curving perspective lines instead of straight converging ones to approximate the image on the retina of the eye, which is itself spherical. They discuss in detail how the size of objects decreases as they recede in all directions. Barre and Flocon offer a 'curvilinear formula' which can be used to draw three-dimensional objects on two-dimensional surfaces. This resource altered the way I approached the transformation of movement between two and three dimensions. It defined new directions for the series of work *Inscribing* (2015–2019).

By understanding and employing curvilinear perspective I employed the dynamic qualities of line to activate the planes on the surfaces of my object using line. Previously in this series, my engraved lines divided the surface into planes, using Euclidian geometry, which uses straight lines. My surface remained as flat planes, I did not achieve the three dimensionality I was striving for. By experimenting and employing Barre and Flocon's system, which accurately describes how we see and experience curved surfaces, I began to devise ways to bend flat surfaces into curves, which receded backwards towards the edges using reductive glass lines. (Fig. 5.4)

Another turning point in this investigation came after reading 'Structural Families', in Colliers' *Form, space and vision*, which addresses theories on drawing in relation to observing and exploring the space of objects. The chapter discusses in a clear and concise manner the duality of the structure of volume and space. Collier states:

> In referring to the volume of a solid form or mass we mean its density—the amount of space occupied by a substance. But volume may also refer to regions of space *per se*—to the emptiness which is positively shaped by surrounding surfaces the volume of the whole. Therefore, we must be careful to qualify the word, and talk about the mass volume or space volume.[54]

53 Michele Emmer and Doris Schattschneider, *M.C. Escher's Legacy: A Centennial Celebration*, 2003, Berlin and New York: Springer.

54 Collier, *Form, Space and Vision*, p122

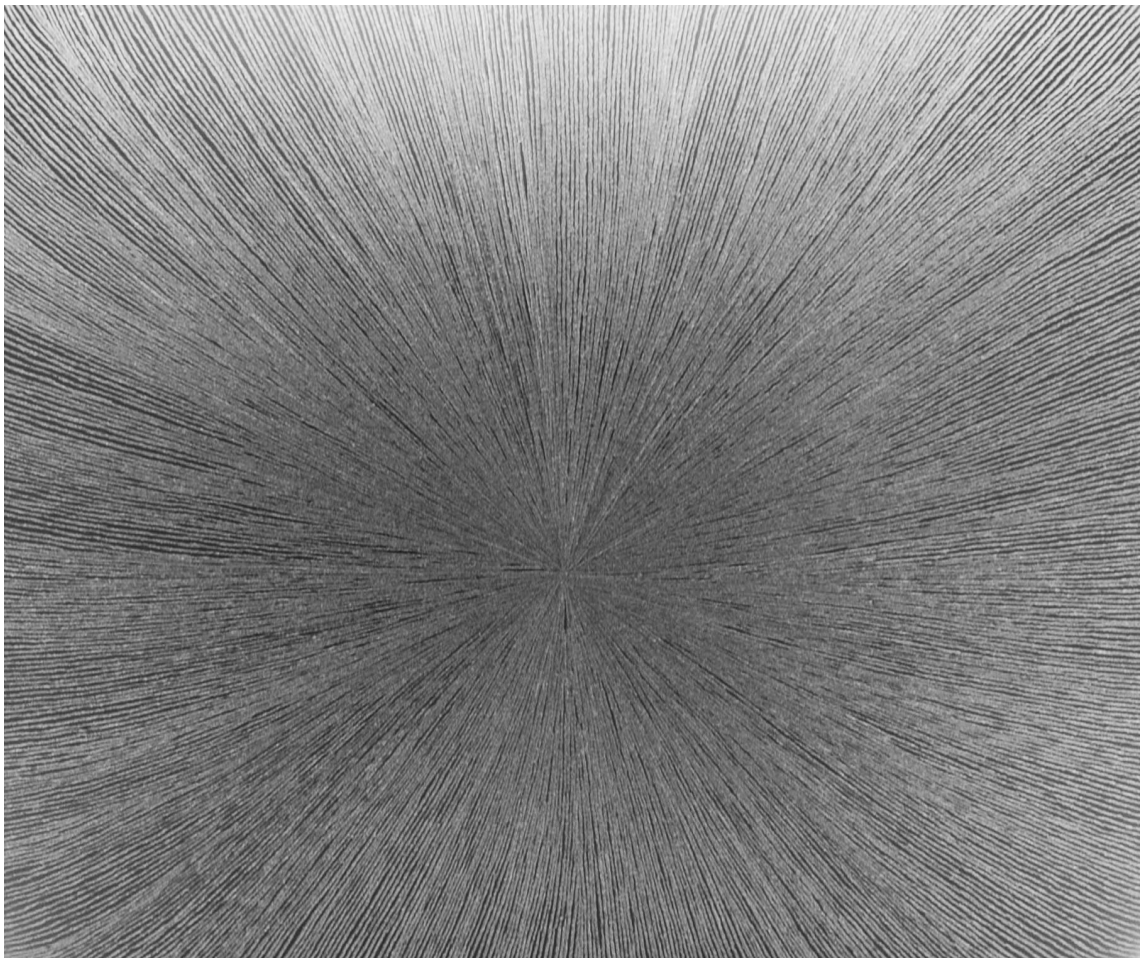


Fig. 5.3 Mel Douglas, *Studio exploration (spatial study) #18* 2015, kiln formed and coldworked glass, 15 x 15 x 5cm.

Fig. 5.4 Mel Douglas, *Studio exploration (spatial study) #19* 2015, kiln formed and coldworked glass, 45 x 45cm.

This statement resonated with my own research, I directly related the way Collier discusses mass volume and space volume as two separate entities, and applied this duality to the spatial forms I was developing. Enabling line to shape both the mass and the volume, line becomes the connective tissue between the two. Using glass as the drawn line and the substrate gave me a unique opportunity to have both the mass and space volume connected through the transparent surface.

Visual references

In view of my readings on geometry, my field studies led me to make further connections to my practice by investigating and observing the role of geometry and space while considering Lazlo Maholy-Nagy's, *Space Modulator* (1939–45) (Fig.5.6), and Susan Hefuna's set of works, *Building* (2009) (Fig. 5.8) which were both on display at the Guggenheim Museum in New York. Along with Sol Le Witt's *Wall Drawings* (1968) (Fig. 5.9) and Fred Sandback's *Two Part Construction* (1996) (Fig. 5.10), which are installed permanently at Dia: Beacon in NY State. Seeing how these four artists used line and surface to articulate space, provided me with intimations of ways I could apply glass lines to articulate space during my residency at the Bullseye Factory, which I will discuss later in this chapter.

Close viewing of these four works revealed how lines of light and shadow can extend a drawing from the surface; how fields of lines on a flat surface can generate movement and transform a surface; how a line can conceal and revel itself to move through space; and how a singular line can demarcate space and volume.

Lazlo Maholy-Nagy's, *Space Modulator* used the relatively new material of Plexiglas. (Fig. 5.6) The reflective and transparent qualities of the Plexiglass served his intention to modulate and activate light, his favourite medium, in order to create motion and movement. By observing how Maholy-Nagy used multiple layers of transparent materials to float lines in and out of a three-dimensional plane, I saw the way he utilised the front surface of the material, the back side and the edges to move his lines through the picture plane. Maholy-Nagy was able to link and bind his drawing together through the use of lines, light lines and shadows, created by solid lines. He connected disparate material together to make line penetrate through each material, floating through space, measuring the distance between each layer.

Seeing this work in the Guggenheim was a revelation, it provided evidence for and demonstrated to me how shadow lines and connective lines can be cast through translucent and transparent materials. Extending drawing from the surface into the interior and back out again. And in doing so, how an additional type of line—a cast light line or shadow can be utilised and incorporated as a line that can connect and move through any type of transparent

or translucent space. I also noted the use of both reductive and additive lines, which gave Maholy-Nagy's linear configurations movement and vitality. This directed me to consider how I could use and employ more light and shadow lines to move line through space and into my objects. (Fig. 5.7)

Susan Hafuna's work *Building* (2009) (Fig. 5.8) was a series of intricate matrices of lines which were interleaved, interknitted, layered and suspended. Like Maholy-Nagy she used all sides of her substrate, which was tracing paper. Even though her drawn lines stopped and started within each sheet of translucent paper, the work revealed enough information so that it appeared to be three dimensional. By using materials that are translucent she plays a game of revealing and concealing to create perspective. It prompted me to consider the capability of glass to hide and reveal space, by using a combination of transparent, translucent and opaque materials. Line can sit on the surface of glass, or it can be embedded. It can also be revealed, veiled or hidden by the substrate.

I also visited Dia:Beacon, in the Hudson Valley, to view works by Sol LeWitt and Fred Sandback. LeWitt's large scale wall works have been a constant source of inspiration for me in relation to his use of line and space to transform surface.

Standing in from of the large scale wall drawings of LeWitt drew to mind a quote I had noted from writer John Berger. He was discussing how the act of drawing was a way to get to know and understand a subject matter:

> Drawing is like a conversation with the thing drawn, likely to involve prolonged and total immersion... A line drawn is important not for what it records so much as what it leads you on to see. Each confirmation or denial brings you closer to the object, until finally you are, as it were, inside it: the contours you have drawn no longer marking the edge of what you have seen, but the edge of what you have become ... a drawing is an autobiographical record of one's discovery of an event, seen, remembered, or imagined.[55]

In the presence of these immense drawings, I drew connections between Berger's notion of drawing (or line making) as a way not only of recording, but of 'seeing', highlighting the direct connection of drawing to thought and to the construction of new knowledge. I started to see these works as wall maps, realising that the action of the drawn line upon a surface became a way of understanding the terrain of the object. Each tiny fluctuation in a line was in response to the surface of the wall. It drew attention to changes in the terrain. I drew connections to my own surfaces; by being more alert to shifts or undulations in surface, I could use the ability

55 Berger, 'Drawing is Discovery,' *The New Statesman* 29 August 1953. URL: https://www.newstatesman.com/culture/art-and-design/2013/05/john-berger-drawing-discovery (accessed 1/5/2015).

Fig. 5.5 Mel Douglas, *Studio exploration (bend flat surfaces into curves)* #20 2015 kiln formed and coldworked glass 45 x 45 x 6cm.

Fig. 5.6 Lazlo Maholy-Nagy, *Space Modulator* 1939–45, oil and incised lines on Plexiglass, 88.6 x 93cm. Collection: Solomon R. Guggenheim Founding Collection. Solomon R. Guggenheim Museum, NY, USA.

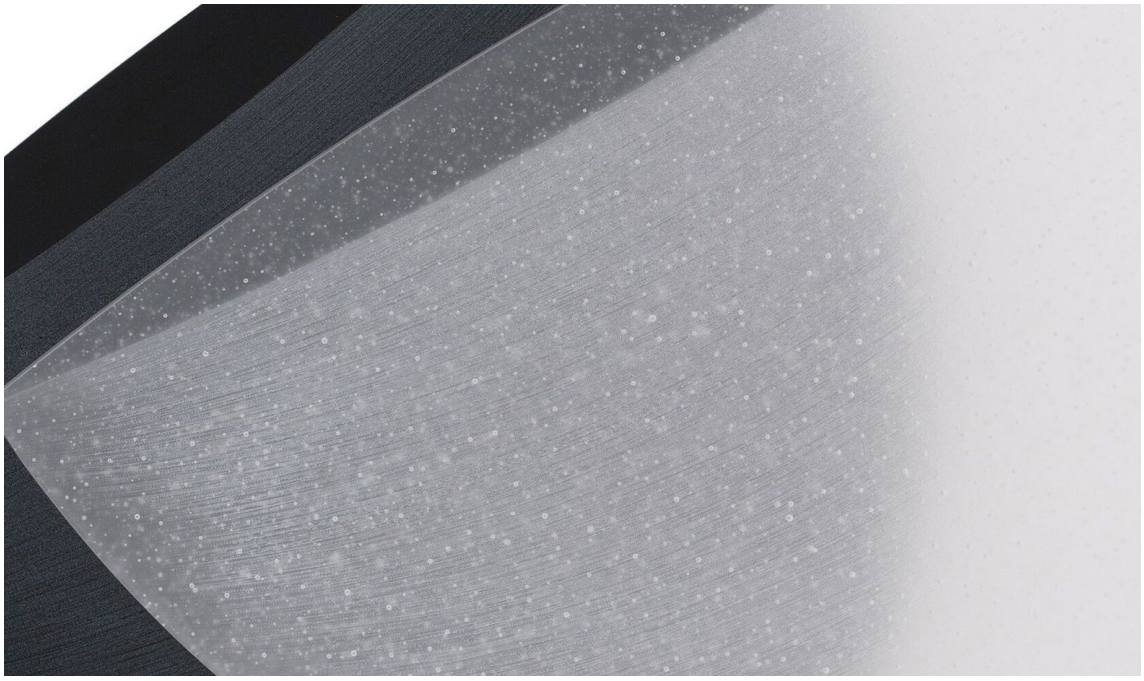


Fig. 5.7 Mel Douglas, *Studio exploration (light lines) #20* 2015, kiln formed and coldworked and engraved glass.

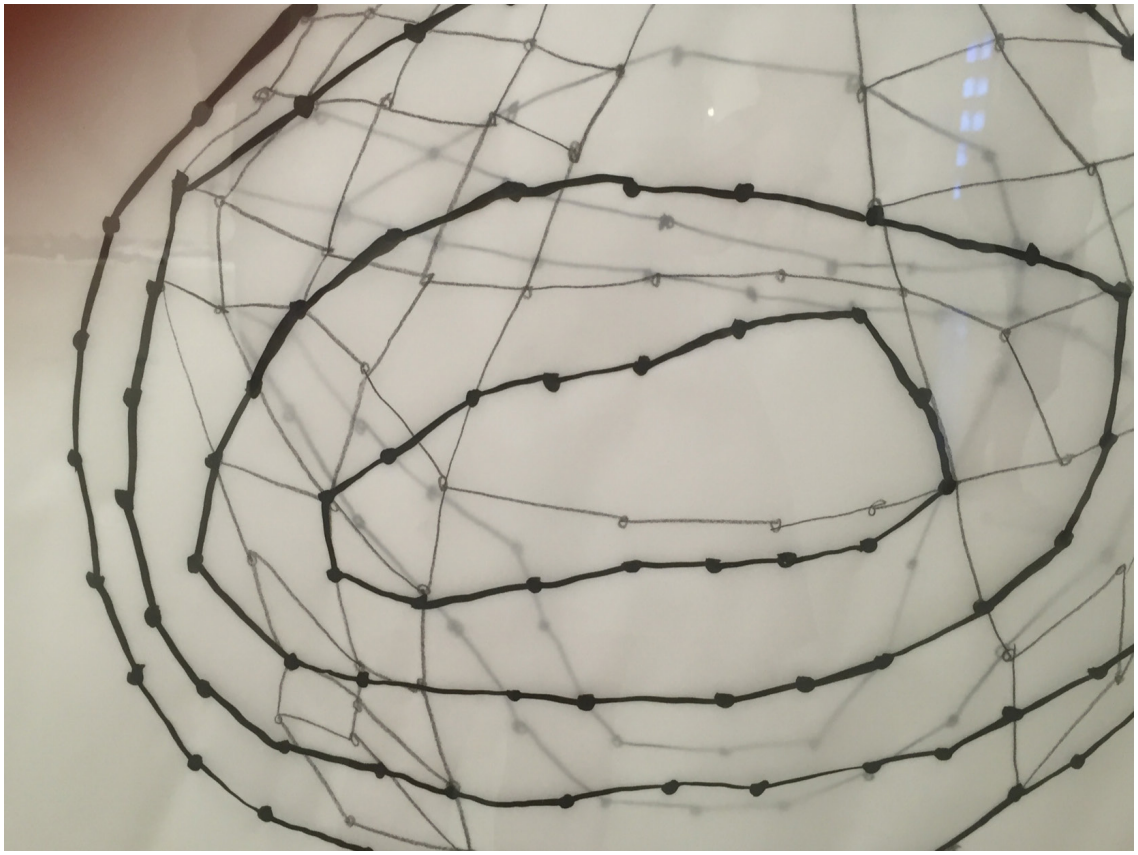


Fig. 5.8 a–b Susan Hefuna, *Building* 2009, ink on tracing paper, nine part, 21.5 x 62.5cm. and detail. Collection: Solomon R Guggenheim Museum, New York, USA.

of line to accentuate or subvert the change. By having a conversation with the surface of my objects, I could construct new ways of seeing, observing or subverting through the connection between surface and line.

LeWitt's large scale wall drawing led directly to further experimentation in my studio, which had me layering multiple fields of lines to delineate space and surface. (Fig.5.9) Exploring the mobility of line, setting a point in motion to activate flat planes into three dimensional surfaces. I used geometry and perspective, shifts in the value of line, tonal shifts, changes in direction. I altered the speed of line through changes in the gauge. I experimented with lines that outlined, crosshatch and shaded, they were singular and they were layered and they started turning what was flat into a curve.

My final stop was at Sandback's installation *Two part construction*. (Fig. 5.10) Sandback used line to demarcate and outline space. The longer I spent with his installation, looking at his outlines, the more it made me think about the solid shapes of my own objects, both flat and three-dimensional. I was able to bring this observation into my studio practice by using the edges of my objects as defining lines in space. I realised the possibility and agency of edges as a drawn line, the rim of an object as an outline, the base as grounding line.

Sandback's installation led me to contemplate the importance and relationship to the space, silence or stillness which is able to suspend line in space, a concept that I have touched upon in earlier chapters. Silence can be a way of focusing attention,[56] a way of sharpening the senses. The importance of silence is illustrated directly in my body of practice-led research. Without the space between each line, the lines become a solid flat surface. Also, often the linear fields become lost and the important marks become the silent spaces.

I see a denser space here, an emptier space there around me. And the architecture presents another kind of space, and so my line is more complicated than this simple figure/ground issue. I think that kind of complexity motivated me to want to get rid of 'the middle.'

Spending time with Sandback's work heightened my appreciation of the power and importance of silence, and how, used purposefully, it plays a potent and essential role within my practice. Sandback's use of silence, nothingness and space is what activates his work. Using simple stands of thread, he weaves three-dimensional spaces and shapes. It is then the viewers' job to fill in the silences with perceived space. Sandback outlines silence, providing it with a border, transforming air into tangible form. He creates motion and stillness, form in space, noise and silence, and tension within the calm.

56 *Oxford Dictionaries*. "Silence (n.)," definition for silence. URL: http://www.oxforddictionaries.com/definition/english/silence (accessed 1/7/2016). Now available at: https://www.lexico.com/en/definition/silence

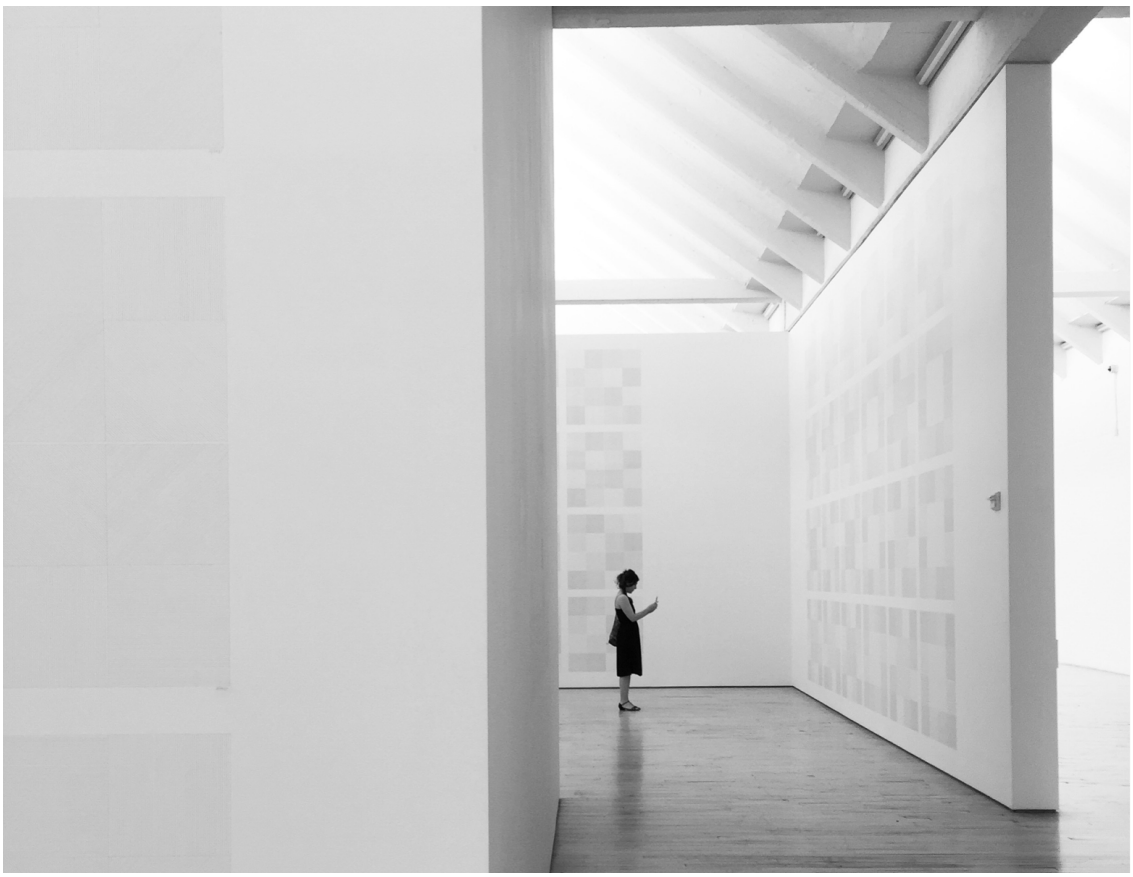


Fig. 5.9 Sol LeWitt, *Wall Drawings #1085: Drawing Series—Composite, Part I–IV* 1968, graphite on wall, 481.3 x 774.7cm. Collection: Gift of Melva Bucksbaum and Raymond Learsy, Dia Art Foundation, New York, USA.

Fig. 5.10 Fred Sandback, *Untitled (Two-part construction)* 1996, ochre and beige acrylic yarn, overall dimensions vary with each installation. Collection: Gift of the Fred Sandback Estate, Dia Art Foundation, New York.

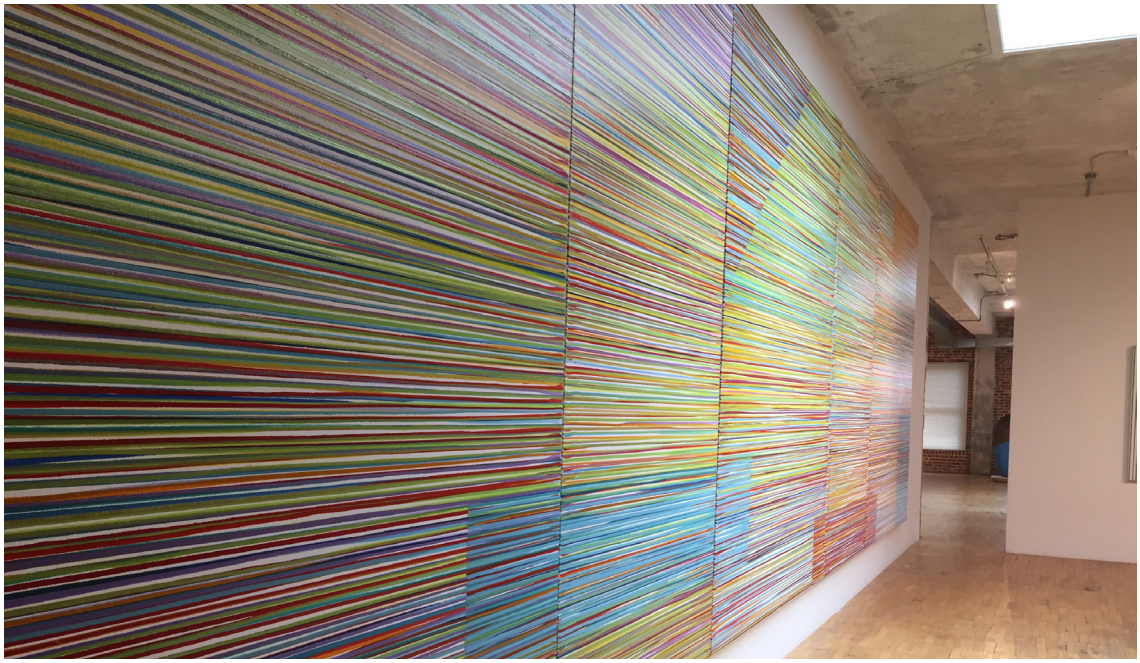
The contrast between Le Witt's wall work and the quiet solitude of Sandback's heightened the importance of contrasting opposites. The importance of the line and the space that surrounds the line. These two installations solidified the significance of what is drawn out, and what drawing out does to the surface of space that surrounds that mark. It highlighted the importance of how objects sit in space and how that space works with objects existing in that space.

These artworks drew my attention to various geometrical elements as a way of creating the illusion of the third dimension, through their application of line and symmetry. These works began to build my spatial intelligence, and assisted me to understand some of the basic systems of mathematics used for describing space. These works also illustrated principles of design and geometry in varying ways to suggest movement, through the application repeated patterns and elements and visual rhythm by combining repeated positive shapes separated by negative spaces. The works showed the use of rotation symmetry, which is equalising visual forces, or elements, by using lines that come out or radiate from a central point. The works used repeating pattern with variations to create unity by stressing the similarities of separate but related parts. These were all devices I explored during my period of studio experimentation at the Bullseye Glass Factory.

Dialogue

I also attended the American Craft Council (ACC) 12th national conference, *Present Tense* in Omaha, Nebraska, 2016. Attending was informative, however, it turned out that the most fruitful part of the conference was having the opportunity to visit Jun Kaneko's private studio. (Figs. 5.11–5.13) Jun Kaneko is a Japanese ceramic artist based in Omaha, whose works in clay explore the effects of repeated abstract surface patterns. Often these are arrangements of straight, curving, and spiralling lines, which create an interplay of abstract imagery on three-dimensional surfaces. I fortuitously got talking to his studio manager the night before the conference started and she offered to give me a tour of his studio, which took up an entire large block along an Omaha city street. The opportunity to spend a significant amount of time looking at Kaneko's research and working methods, seeing some of his less know more experimental work was so stimulating and informative. I was also unaware up until this time of the breadth of Kaneko's practice; many of his works and projects were documented and put on display throughout the building.

Walking into Kaneko's building was like breaking into a treasure trove, it was filled to the brim with a mix of works in progress, tests and experiments along with a gallery for completed works and projects. His studio is located in the central district of Omaha, Nebraska which is



top down:

Fig. 5.11 Studio image of studies, Jun Kaneko's studio.

Fig. 5.12 Works in progress, Jun Kaneko's studio.

Fig. 5.13 a Studio image, Jun Kaneko's studio.

Fig. 5.13 b Images of recent projects, Jun Kaneko's studio.

a sleepy little town. Really the perfect place to think of nothing other than your own studio practice. The studio is a handsome red brick four story building, each of the four levels of the building was dedicated to a singular process: making, firing, glazing, and the top floor reserved for finished works with a large galley space and a project area.

The studio was laid out in such a way that it provided a glimpse into how Kaneko works: his choices of tools and materials; his working methodology through sketch books; plans and physical explorations; and the processes he uses to fabricate his work. Although I did find the scale of the operation quite overwhelming, I was struck by Kaneko's commitment to simple principals of form and line, something that has obviously lasted the test of time and kept him interested and inspired. How he has exploited his ideas and transformed them across so many different disciplines remaining true to his distinct style that carried through to everything he touched. What struck me most was the scale in which he worked and the versatility of his practice.

There were rooms filled with test tiles covered with mesmerising brush strokes. From the moment I set foot in the studio there was a sense of repetition, repetition in the layout and architecture of the building, repetition in both form and marks, and a repetition in rhythm across all the work. My eyes ran from one thing to the next and then back again. The entire studio has a quiet duality between being playful and yet profound, simple and yet complex. Seeing how widely the studio tested, experimented and researched every idea, every possibility, showed the importance of rigorous exploration and examination and how this feeds into more resolved work. More than anything else, the visit demonstrated and affirmed the importance and relevance of practice-led research. This experience, combined with my theoretical research, prepared me for the practice-led experimentation at the Bullseye Factory residency, where I explored new methods to investigate how glass can be used in distinctive ways to explore the relationship of line to three-dimensional space and surface.

Residency—testing the hypothesis

The last part of my field work was a residency at the Bullseye Factory in Portland, Oregon. Bullseye Glass Company was founded in 1974 by three art school graduates and has remained at its core a factory for artists. Since its inception, Bullseye has invited artists to the factory to collaborate, experiment, ask questions, translate their ideas and push the boundaries of the material.

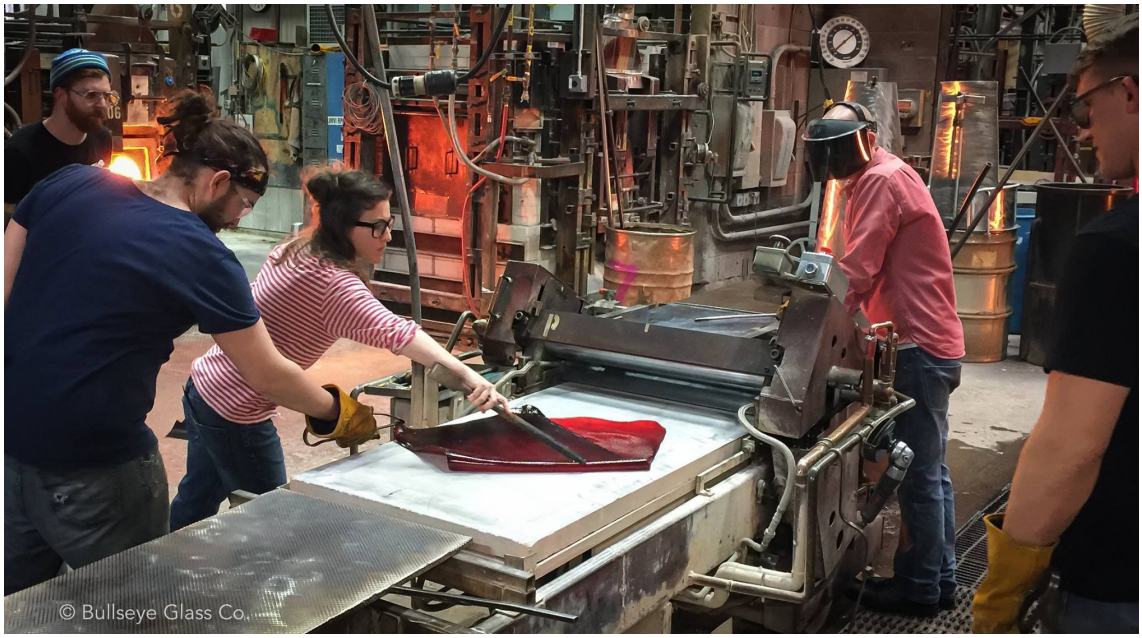
My residency allowed me to reflect on my initial categorisation of lines and Ingold's theorising on line and their relationships to surface. This, combined with my readings on the subject of geometry and my analysis of the work of Maholy-Nagy, Hefuna, LeWitt and Sandback, enabled me to test and articulate new approaches to creating visual space.

By analysing how these four artists moved their lines in and out of space, combined with concepts and theories of perspective and geometry, I created a body of speculative tests which moved beyond the surface of glass. I started to think about each pane or piece of glass as a three-dimensional plane, which could be connected through a physical line or an implied line. I began to incorporate the space between line as a linear element too. I used tonal shifts and varying opacities within the glass to develop new space for lines to travel. For the first time I moved away from solely using opaque glass and experimented with the transparency and translucency of glass to move line through space.

My research during my residency explored how surface and form can be built from a repetitious singular line through layering and fusing glass filaments, trails, stringers, sheet and powders; perspective within a tree-dimensional form by using colour and tonal shifts within layers of fused glass; variance of weight and value of a glass line to map the depth and volume of a three-dimensional object; negative space and the space between a physical mass of glass to create a line of space, or a void; line as light or shadow—using filaments or trails of glass to create a shadow line, using a combination of opaque and transparent glasses; how lines of light and shadow can extend a drawing from the surface; how fields of lines on a flat surface can generate movement and transform a surface; how a line can conceal and revel itself to move through space; and how a singular line can demarcate space and volume.

As my research progressed, I started to see six distinct streams of work developing. I came to understand this as my own taxonomic system of categorisation: Mapping, Inscribing, Rendering, Highlighting, Transcribing and Tracing. These categories are considered in great detail in the Chapter 6. The images below provide an indication of what I achieved and explored during the Bullseye residency.

The residency gave me four solid weeks to experiment, with access to state-of-the-art equipment, all the glass I could possibly need and more, along with the support of a highly skilled and knowledgeable team of staff. This time enabled me to consolidate my research, to test all of the ideas and theories that I had gathered during my research, in a practical and tangible way. The experimentation brought me to a place where I had a solid idea of where I thought my final body of studio work was headed. It Illustrated how objects, in both two and three dimensions can spatially merge surface and drawing, where the form is not a canvas but a three-dimensional drawing in itself. My discoveries are presented in the following chapter, where I confirm how glass can be used in distinctive ways to explore the relationship of line to three-dimensional space and surface.


© Bullseye Glass Co.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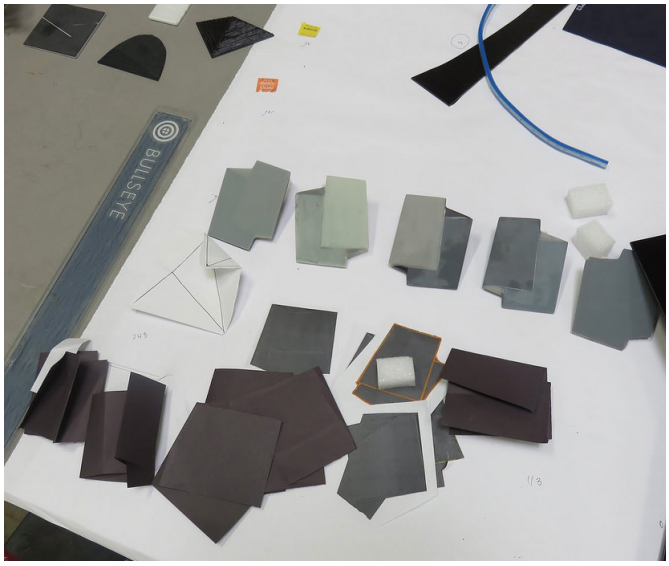


opposite, top down:

Fig. 5.14 Working image, glass drawings, Bullseye Residency. Photo: Lani McGregor.

Fig. 5.15 Working image, Bullseye Residency.

Fig. 5.16 Working on the casting floor, Bullseye Residency.

Fig. 5.17 Floor talk, Bullseye Residency.

above, top down:

Fig. 5.18 Working image, Bullseye Residency.

Fig. 5.19 Working image, Bullseye Residency.

Fig. 5.20 Studio exploration, Bullseye Residency.

Section Three—Confluence of Line and Surface

Chapter 6: Configuring new space

Confluence, or the union of line and surface, catalogues how my enquiry and experimentation developed into a body of practice-led research. This chapter discusses and identifies how my explorations led me use glass as a drawing material, in new and distinctive ways to explore the relationship of surface and space. Armed with newly acquired knowledge, new ways of thinking about and working with glass, this body of studio research pushed beyond what I knew, or what I thought I might learn. French philosopher Gaston Bachelard wrote in *The Poetics of Space,* 'It is better to live in a state of impermanence than in one of finality.'[57] By keeping a playful sense of 'what if', this body of research has continually changed as it has unfolded.

While a state of impermanence and 'what if' became my mantra along this journey, it was also important and exciting to be at a point in my research where I could pause, and reflect on my outcomes. This isn't to say that I wasn't reflective during my candidature, but I know now that I have arrived at a point where I understand what the intention of my research is and I can articulate what I wanted to achieve. This chapter uses my final body of work as markers to trace my outcomes and to discuss my findings.

As this body of work developed my own taxonomic system started to appear. The six categories of linear, surface and space investigations that I identified are: Mapping, Inscribing, Rendering, Highlighting, Transcribing and Tracing. (Fig.6.0) Each of these groupings explored alternative techniques to draw with or on glass. Within each of these categories I looked to concepts within geometry, drawing, printmaking, glass and philosophy to support my exploration. The techniques ranged from glass as a hot and molten liquid line, as a powder (medium) for screen printing, in sheet form as a drawn plane, to a surface to carve into and trace upon. In the following sections I introduce each of these categories and, through examples, outline my findings.

The first category, *Mapping*, took form as blown, three-dimensional objects and surfaces. This series explored the surface of glass objects, the interior, exterior and the space in between. Using the transparency, translucency and opacity of glass this series considered building boundaries between the outside and inside, suspending lines in space.

The second category, *Inscribing*, bridged the space between two- and three-dimensional

57 Gaston Bachelard, *The Poetics of Space*, 1958, Boston: Beacon Press.

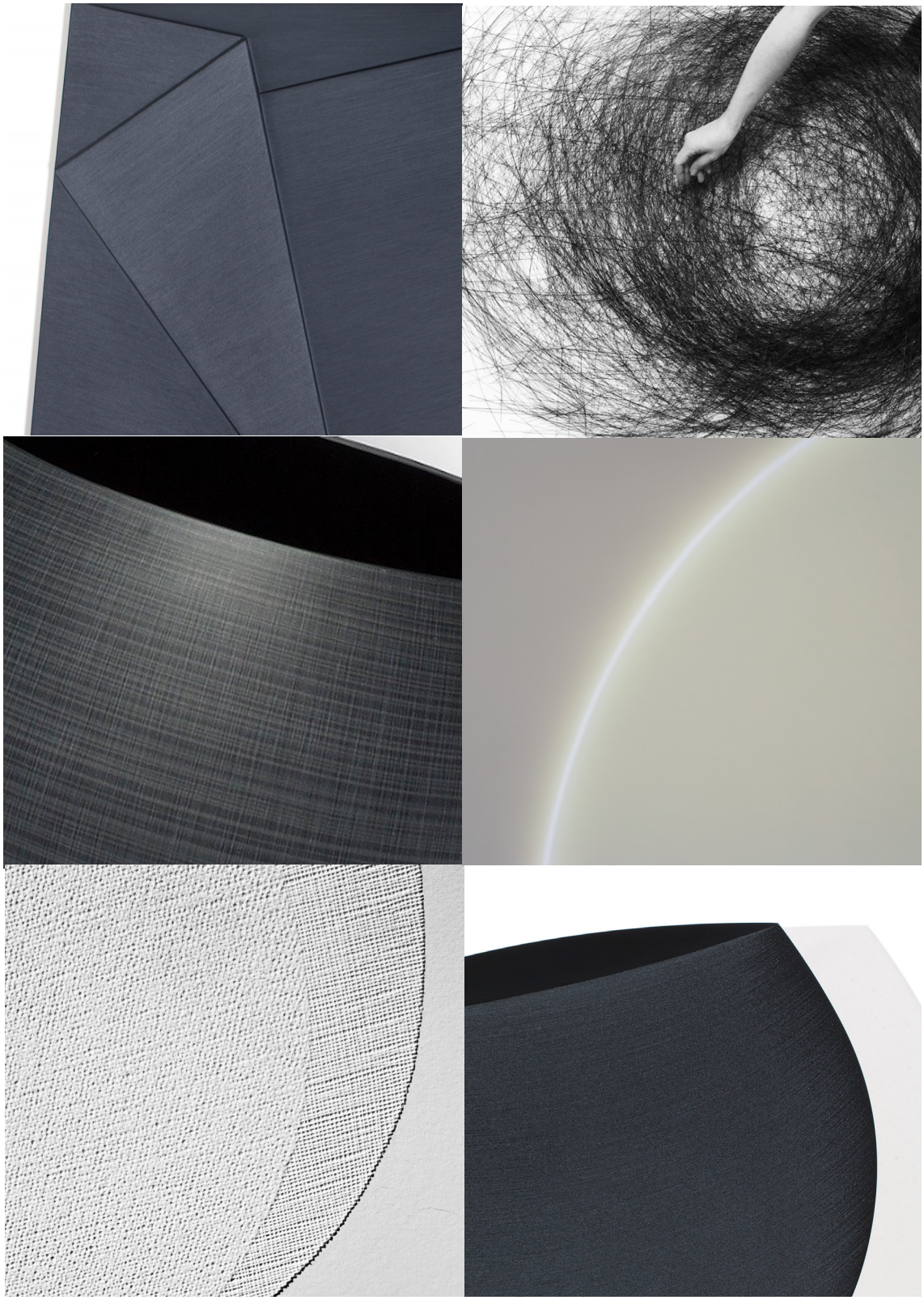


Fig. 6.0 Mel Douglas, collage of the series *Mapping, Inscribing, Rendering, Highlighting, Transcribing* and *Tracing*. Photos: David Paterson.

perspectives. It was the connective tissue that linked two and three dimensionality and back again. This series set me on a course that looked at alternative theories of representing three-dimensional space on a flat plane and had me experimenting with new ways of utilising geometry to subvert surfaces.

Rendering explored the relationship of space, line and plane. By using directional lines, on two-dimensional glass surfaces, I established distinct planes through the use of low relief and engraving to animate flat fields. Using logic, systems, progressions, Euclidian geometry and mathematics, I found that I could fold something flat into a modulated surface.

My fourth category, *Highlighting*, employed the unique properties of glass: transparency, translucency and opacity, as a way of concealing and revealing space. Light and shadow were used to create new volumetric windows. By layering sheets of glass, I developed what I have coined 'light line' which are lines of glass that move through the surface of glass, into the substrate and out the other side. Highlighting identifies how glass, as a drawing material, and as a substrate, can offer new techniques of drawing with light and shadow.

Transcribing delved into the possibilities of glass powder as a medium for silk screen printing. Directly screening glass powder onto a kiln shelf and firing the drawing, what remains is a thin flexible illustration. These flexible line drawings demonstrate the potential, versatility and mobility of glass as a drawing material. A hand-drawn sketch is transformed into a solid moveable and yet malleable three-dimensional object by heat.

Lastly, *Tracing*—a series of line drawings made from glass threads, one of the most distinctive ways of drawing with glass. Glass threads are drawn out in a hot and malleable state. These glass lines solidify almost instantly into a fixed record of gesture and movement in time. My glass line drawings, made from hand-pulled glass threads, capture gesture, and illustrate the ability of glass lines to shape, provide tonal variation, depth and volume.

The following paragraphs describe in greater detail these categories and illustrate the discoveries that were made in the studio through practice-led research. This research allowed me to distil ideas, and ways of working, down to their purest form. In making this body of work I re-discovered a material I have had a long affinity with. By working with glass as a drawing practice, I have learnt and applied conventions of drawing which have allowed me to use glass lines in distinctive ways to explore the relationship of surface and space.

Mapping

To map is to draw upon a plane surface representing a part or a whole of the surface, with the

various points drawn in proportion and in corresponding positions.[58] *Mapping* took form as blown, three-dimensional objects and surfaces. This series explored the mass (convex) and space (concave) volume of objects through drawing. By using continuous lines, both additive and reductive, on the interior, exterior and the space in between (substrate), the works map and define space. By using the transparency, translucency and opacity of glass works from the *Mapping* series explore the boundaries between the outside and inside, and suspended lines in space.

Both the space and mass volume of *Callow* (2016) from the series *Mapping* (Fig. 6.1) are visually and structurally highlighted by the linear emphasis given to the curved surfaces of the object's architectural shell. The additive traces are hot trails of glass bound and wound around a glass form. The glass trails are applied to the substrate as a hot malleable thread. I experimented with varying the weight of the line which can be altered depending on the distance at application. The reductive element is engraving, the removal of material from a glass substrate, resulting in scratched linear detailing. This can be varied too depending on the pressure of the hand, the speed of the hand and the coarseness and size of the abrasive tool. The additive materials build a low relief surface on the substrate, while the reductive lines remove material from the substrate, providing two entirely new planes (to the substrate).

As the glass traces became intertwined, they start to become the fabric of the object, building a new surface, on the interior, on the exterior and embedded within the substrate. I then used reductive engraved lines, which covered the surface, effectively transforming it back into threads. I use shapes that reference the vessel, often working with the bowl. Open three-dimensional glass forms offer an opportunity to work on three planes, contrasting opposite planes and interconnecting spaces: the interior, exterior and the connective space in-between (substrate). These objects have three volumes of space—an empty space which is surrounded by a mass, this mass has a surface and a volume itself.

wove.woven.weave (2017) from the series *Mapping* (Fig. 6.2) is a series of three open forms that explore the notion of line as infrastructure. There are multiple linear elements which inform and direct this work. There are glass lines imbedded within the fabric of the objects, glass trails which sit on the surfaces of the objects and engraved trace lines which run from the lip of each object to the base. I employed four graphic linear elements to express the structure of the mass volume and space volume in this series. These are: continuous surface directional line, continuous surface directional tone, light tones for projecting mass-volume and dark tones for receding mass and for space volumes.

58 Douglas Harper, nd. 'Etymology on line.' *Online etymology dictionary*. URL: http://www.etymonline.com/ (accessed 3/8/2016).

Fig. 6.1 Mel Douglas, *Callow* 2016, from the series *Mapping*, blown, coldworked and engraved glass, 30 x 40 x 40cm. Photo: David Paterson.

The nineteenth century artist Eugene Delacroix wrote in his journal, 'take hold of objects by their centres, not by their lines of contours.'[59] Essentially what he is saying is, we need to think of objects as masses, not as outlines. He urges us to think about the planes and curves of surfaces that make up their mass. Delacroix's concept of representing mass directed me to investigate how glass lines as a surface to build and define mass. I did this by recording the terrain of the curved surface which contain the mass, defining the space through the use of contoured line.

This series brought to light a distinctive property of glass as a line making medium and its ability to transform surface. By winding threads over the top of a body of glass, I am able to dissolve the surface and turn the lines, back into traces (Figs. 6.3).

However, within the *Mapping* series a second transformation occured. In these works traces are transformed back into threads when the object is inflated and shaped, as the lines expand and contract in response to the form being inflated. This allows the lines or drawn surface to explore the specific volume of the object which can also be amplified or intensified by the shifts in colour of the wraps. As the size, volume and mass of the form changes, the colour changes accordingly, either intensifying or diluting. By using the interior and exterior and both spaces within the set of work, *wove.woven.weave* I was mapping the two distinct structural volumes, the mass volume and the space volume. The mass volume is the solid form or mass, its density, the amount of space occupied by its substance, the outside surface. The second volume is the interior surface which is the space volume, the empty space which is shaped by the surrounding surfaces. The black interior/exterior and lip of the vessel became a boundary. Like the edges of a sheet of paper, these become frames for the drawn inside/outside surface. The lines on the outside define, restrict and encircle the form while the linear wraps become another limit and frame for the objects.

I became aware that I was using the substrate—the black body of the objects—as a boundary and as a space line or interstitial line. I began to draw connections to the way I was using the substrate as a glass line to measure both the mass volume of the exterior and the space volume of the interior in the way Sandback had with his work. Defining and articulating the space through line, I noticed how the black boundary lines started to draw the eye across the forms from the inside to the outside and then along the lip of the third vessel.

59 Thomas Buser, nd. 'Chapter 7: The Twentieth Century I,' *History of Drawing*. URL: http://historyofdrawing.com/twentieth_century_i/ (accessed 10/3/2019).

Fig. 6.2 Mel Douglas, *wove.woven.weave* 2017, from the series *Mapping*, blown, coldworked and engraved glass, 30 x 120 x 40cm. Photo: David Paterson.

Fig. 6.3 Mel Douglas, *wove.woven.weave* 2017, (detail), blown, coldworked and engraved glass, 30 x 10 x 40cm. Photo: David Paterson.

Fig. 6.4 Mel Douglas, *Mid tone 1–7* 2018 (detail), blown, coldworked and engraved glass, 45 x 350 x 45cm. Photo: David Paterson.

Thinking and using the different spaces of the interior and exterior led me again to the writing of Bachelard who wrote:

> Outside and inside form a dialectic of division, the obvious geometry of which binds us as soon as we bring it into play in metaphorical domains. It has the sharpness of the dialectics of yes and no, which decides everything.[60]

He then goes on to say, despite their mutual resistance, both inside and outside depend upon one another:

> Outside and inside are both intimate spaces; they are always ready to be reversed, to exchange their hostility. If there exists a borderline surface between such an inside and outside...[61]

Although he does not use the word 'threshold', he implies that there is a borderline surface between the inside and the outside. The door (in architecture) or the space between links the two spaces, the two spaces that are interdependent on one another. The connotations of this passage led me to think about the importance of the interconnection between the inside and outside of my objects. I devised ways to make the connection between the interior and exterior space of my objects more apparent. I wanted to see if I could connect line—map the interior terrain by connecting the inside and the out through this threshold, binding and interconnecting the space of the public/private. I referenced the way in which Maholy-Nagy was able to connect his layers of drawings. I noted that by using a transparent body of glass this divide between the outside and inside could be dissolved or connected. By building objects made of transparent glass I built lines on the innermost and outermost surface, which connected shadow lines. I used this connective line to create an illusion of depth, an idea expressed in the work *Mid tone 1–7* (2018) from the series *Mapping* (Figs. 6.4 and 6.5).

Mid tone 1–7 was one of my first explorations with transparent glass, in which the objects were transformed into volumes of light. These objects were made from clear bubbles of glass which were wrapped with variations of tonal mixes of black and white horizontal wraps. These wraps were bound inside the surface of the glass, providing a threshold between the inside and outside. Further, I reflected on a quote from Helmut Rickie:

> The skin is a boundary where everything comes together; it is the narrow dividing line between inside and outside, where everything is concentrated.[62]

He goes on to elaborate how the object is defined by this boundary. This quote from Rickie

60 Bachelard, p216.
61 Bachelard, p216.
62 Rickie, p12.

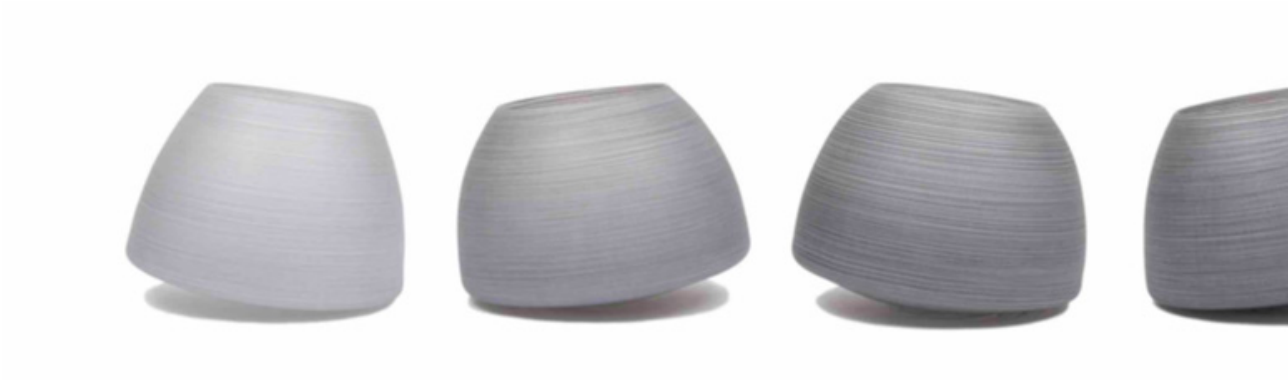
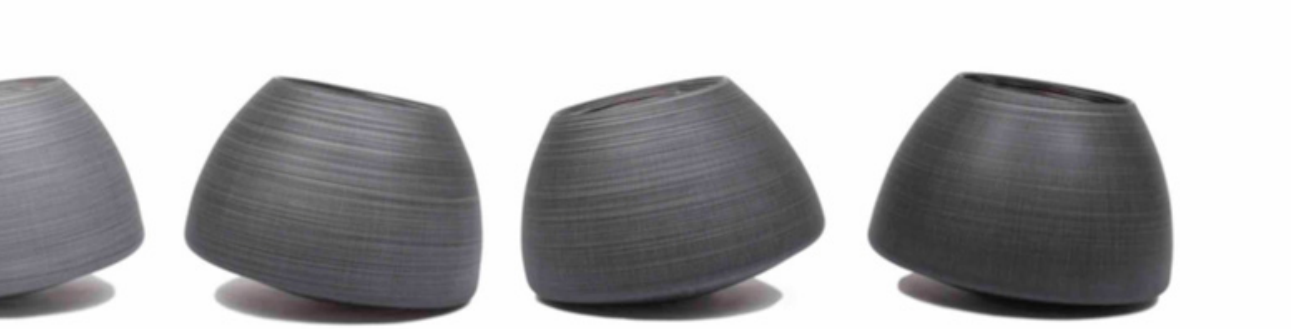


Fig. 6.5 Mel Douglas, *Mid tone 1–7* 2018, from the series *Mapping*, blown, coldworked and engraved glass, 45 x 350 x 45cm. overall. Photo: David Paterson.



encouraged me to explore the agency of the narrow dividing line, between outside and in. The series *Mid Tone 1–7* used the transparency and translucency of the substrate, allowing my surfaces to become a dividing surface, which built a boundary between the outside and inside and suspended lines in space. Using the transparency of the glass (for example Maholy-Nagy and Hefuna) the suspended lines in space cast shadow lines that bound the interior and exterior surfaces into a three-dimensional drawing.

This series also allowed me to define and direct the different viscosity of glass, achieving varying line and tonal values within the work. Through combining stiffer colours, like white, I was able to achieve a tighter, thinner and more pronounced line. In contrast, softer colours, like black, melt at a lower temperature, so the line is much softer, and bleeds into the substrate making a thicker more painterly line. To achieve the tonal gradation between these works took much experimentation. It was a steep lesson in the power of the opacity of colours and how this greatly effects tonal changes within drawings.

Inscribing

The second category of work was Inscribing, which is to write or carve on something, especially as a formal or permanent record. In geometry it can be used to draw a figure within another so that their boundaries touch but do not intersect. This series bridged between two- and three-dimensional perspectives. It was the connective tissue that led me between working two and three dimensionality and back again. Inscribing set me on a course that looked at alternative theories of representing three-dimensional space on a flat plane through experimenting with new ways of utilising geometry to subvert surface through the use of line. This group of works is constructed from sheets of flat glass, which are line as structure, cast into a low relief wedges, using heat and gravity. This series examine volumetric drawing and illusionary space.

Bifold) (2017) from the series *Inscribing (*Figs. 6.6 and 6.7) examines volumetric drawing and illusionary space. After observing how Sandback outlined space using single defining lines, and with theories of curvilinear perspectives in mind, I moved beyond applying line to these forms to create flat surfaces. I began using reductive surface lines to provide perspective. By embodying the concept that the lines should reduce and recede into space in all directions, and an object would recede into space, this series had me rethinking the geometric symmetry of the forms. I also reconsidered the shape of the top surface, opting for a gentle curve, as it would be seen in life. In addition, I began to think of all edges of the form as lines themselves, defining the space of the object. By taking these edges back to a high polish, they too receded back into space and were able to reflect light.

Fig. 6.6 Mel Douglas, *Bifold* 2017, from the series *Inscribing*, kiln formed and coldworked and engraved glass, 58 x 65 x 6cm. Photo: David Paterson.

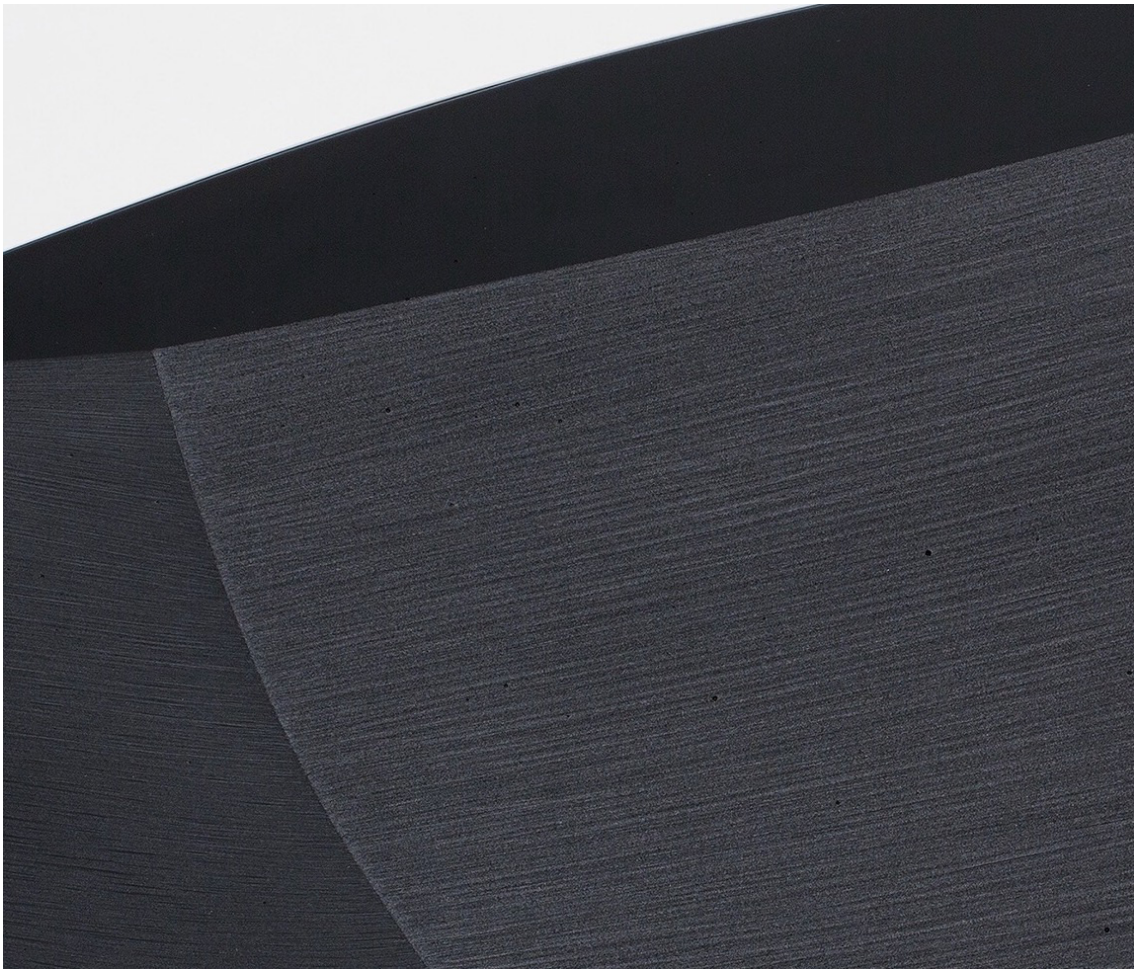


Fig. 6.7 Mel Douglas, *Bifold* 2017 (detail), kiln formed and coldworked and engraved glass, 58 x 65 x 6cm. Photo: David Paterson.

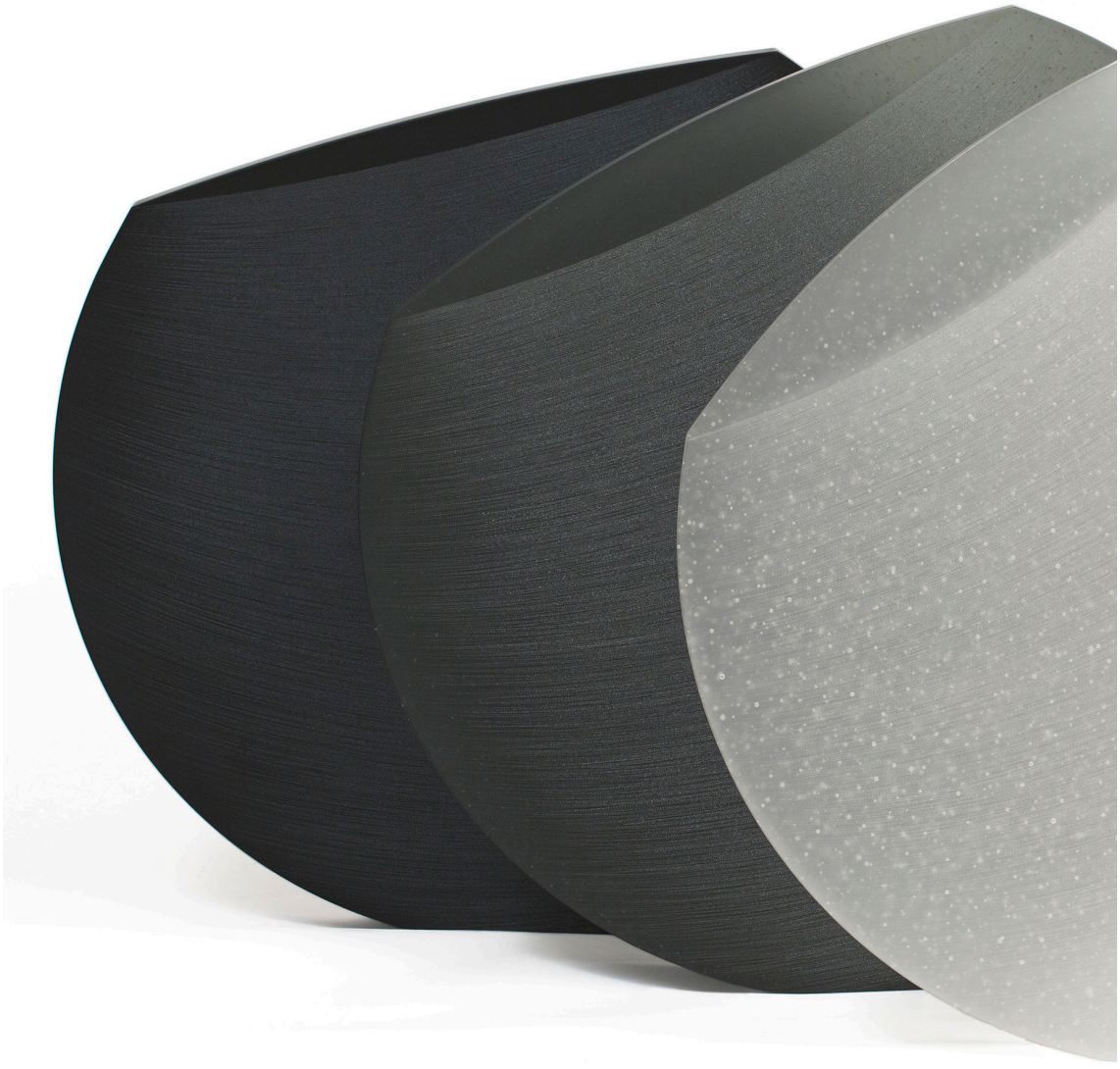


Fig. 6.8 Mel Douglas, *Hue, tint and shade* 2018, from the series *Inscribing*, kiln formed, coldworked and engraved glass, 3 @ 60 x 60 x 6cm. Photo: David Paterson.

I applied reductive engraved lines to articulate planes across the surface of *Bifold*. Playing with variances in the coarseness of the engraving tool, along with the pressure of my hand, I developed ways for line to articulate space, rhythm and gesture, creating junctions in my linear fields that isolate separate planes on a singular surface. I used line as a way of segmenting and dividing the surface. Mathematically defining the surface into a junction, a fold, a demarcation or boundary, the surface area has been separated into two planes through line coalescing and changing direction.

Hue, tint and shade 2018 from the series *Inscribing* (Fig. 6.8) makes use of light and shadow lines. By applying multiple fields of reductive lines on the surface, in varying tones, these fields of lines suggest and imply volume. The varying tonal grades of engraved line shade and highlight the surface, bending the flat surfaces into curves. By employing Flacon and Barre's systems of curvilinear perspective, I created three-dimensional volumes, flat objects that moved forward into and receded back in space.

Using simple flat patterns of interlocking lines, I was able to invoke an illusion of shallow depth. Subtle curves and changes in the direction bring a sense of agitation to the surfaces, making these optical drawings ambiguous. Each can be read in different ways depending on your vantage point. The flat unengraved surfaces at the top of the forms become open space, voids which hold the light. These open volumes are delineated by the profile of the top and the edge of the field of lines.

The three works in *Hue, tint and shade* also explored the qualities of transparency and translucency in glass, which filter light through the material as light and shadow lines. The solid lines engraved on the surface cast shadows into the interior and space, allowing light lines through the body of the glass, making the lines move in and through substrate, alluding to a space beyond the surface. As important as the lines are, so becomes the spaces between. The 'lacuna' or missing space, the unfilled gap or space, pause, break, cavity, interval and opening become a contrasting element to the lines. Poet Rainer Maria Rilke was quoted saying:

> These trees are magnificent, but even more magnificent is the sublime and moving space between them.[63]

Learning how to activate, and precieve the spaces between lines was a very important outcome of my research. The concept links back to the writing of Bachelard and Rickie, who both raise ideas about spaces that are made through the junction or absence of other spaces. By there being a break or an absence, there is a new presence.

63 Bachelard, p 201.

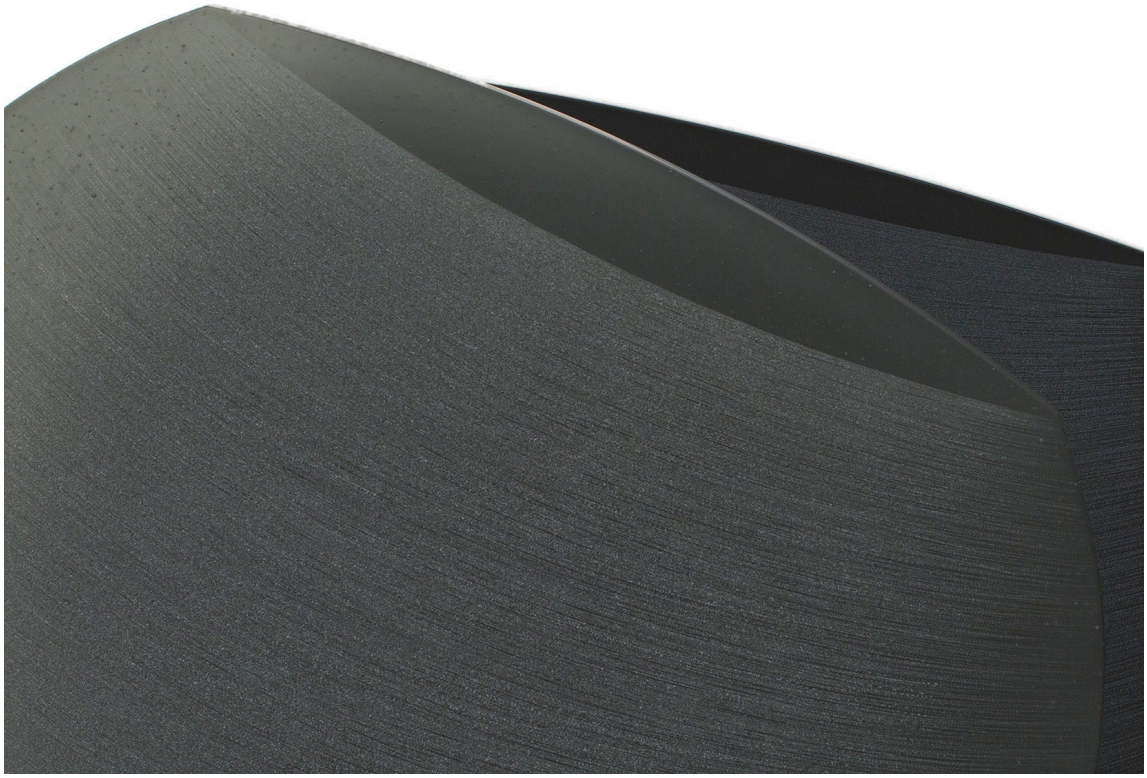


Fig. 6.9 Mel Douglas, *Hue, tint and shade* 2018 (detail), kiln formed, coldworked and engraved glass, 3 @ 60 x 60 x 6cm. Photo: David Paterson.

Rendering

Rendering is the third category of work. Rendering is to cause to be or become.[64] This series explores the relationship of space, line and plane. By using directional lines, on two-dimensional glass surfaces, I have established distinct planes through the use of low relief and engraving to animate flat fields. Using logic, systems of progression, Euclidian geometry and mathematics, I experimented with how I could fold something flat into a moving surface. M.C Escher, who was fascinated by the mystery of perspectives stated:

> I cannot help mocking all our unwavering certainties. It is for example, great fun to deliberately confuse two and three dimensions, the slant and space, or to poke fun at gravity. Are you sure that a floor cannot also be a ceiling? Are you absolutely certain that you go up when you walk up a staircase?[65]

By applying some of the principles of geometry and perspective I was able to experiment with spatial ambiguities and optical illusions. Through the use of multiple overlays and the compression of grid patterns, I was managed to create depth within my surfaces as space folds and lines recede to infinity.

Onyx (2017) from the series *Rendering (*Fig. 6.10) explores the relationship of space, line and plane. By using directional lines, I established distinct planes that animate the glass surface. I experimented with changing the depth of the lines, their angle and direction. The junctions of the lines themselves started to become another articulating line. The movement and change in direction in the fields, facet the surface, folding it into planes. Through this exploration of reductive line, I could to reconsider what it means to engrave the surface of glass. It is not simply inscribing lines into a surface. The act of removing material creates a new surface. Reductive traces that cover the whole body or the entire surface of a substrate have the ability to transform a surface back into traces. The reductive traces in *Onyx* reveal and expose parts of a substrate that usually remain unseen or unexploited. In the case of reductive engraved lines on glass, it made me value the simplicity in rupturing or disrupting the surface and how that disturbance becomes a vehicle to hold light. (Fig. 6.11 and Fig. 6.12)

In *Centrefold* (2018) from the series *Rendering* (Fig. 6.12) a flat sheet of glass is folded, twice towards the middle and then a third time outwards. Cutting the glass and stacking it into this folding form, I used the edges (unmarked as solid black hinged lines) in stark contrast to tonal sifts in the field of surface lines which draw areas into the foreground and push others back.

Two fold (2018) from the series *Rendering* (Fig.6.13) from the series, used folded planes, changes in the plane, tonal variations, and changes in the direction and junction of line.

64 *Dictionary.com*. nd. 'Render (n.),' definition for line (unabridged). URL: https://www.dictionary.com/browse/line (accessed 1/7/2016).

65 National Gallery of Victoria, 'Escher X Nando: Between Two Worlds.'

Fig. 6.10 Mel Douglas, *Onyx* 2017, from the series *Rendering*, kiln formed, coldworked and engraved glass, 120 x 85 x 5cm. Photo: David Paterson.

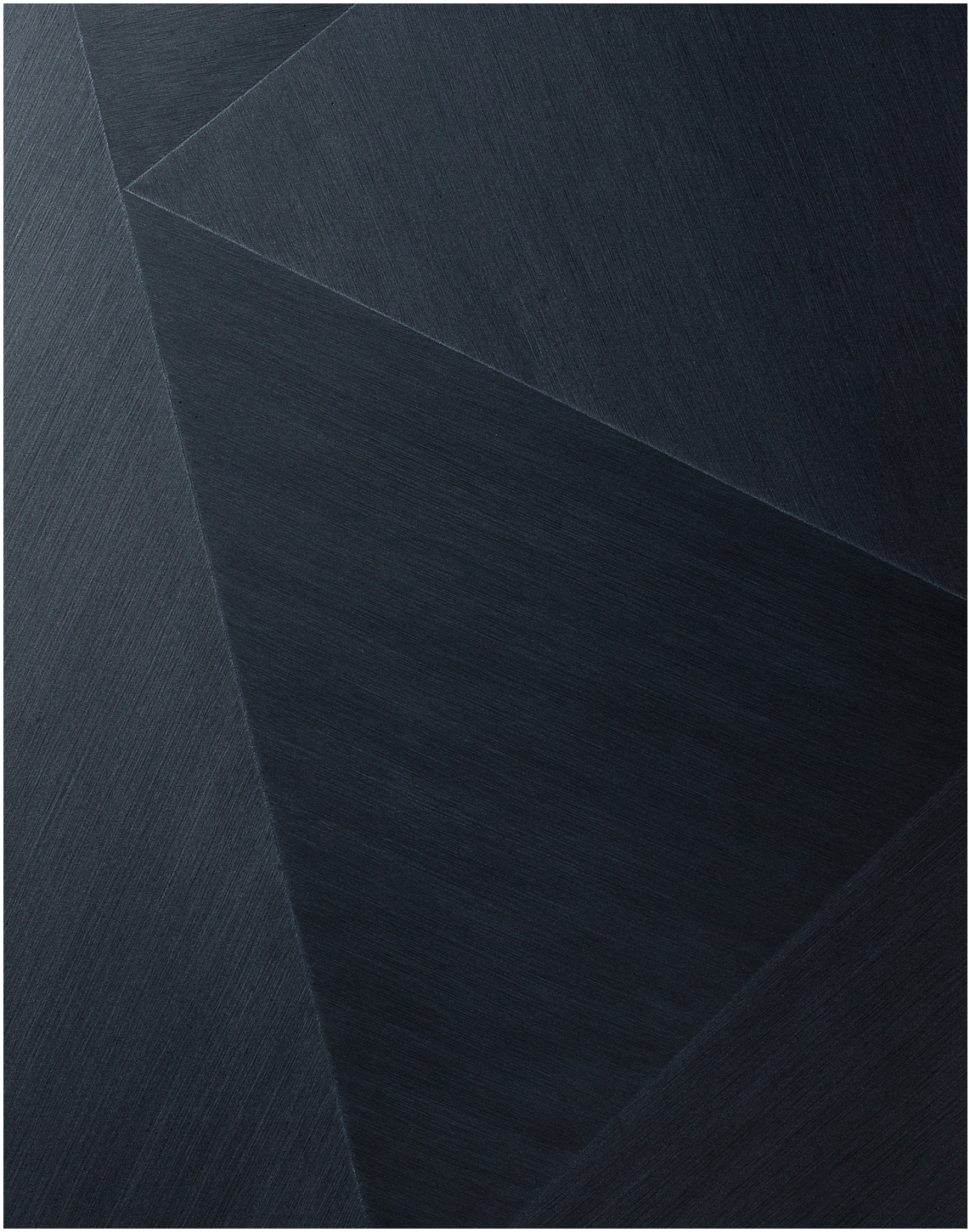


Fig. 6.11 Mel Douglas, *Onyx* 2017 (detail), kiln formed, coldworked and engraved glass, 120 x 85 x 5cm. Photo: David Paterson.

Fig. 6.12 Mel Douglas, *Centerfold* 2018, from the series *Rendering*, kiln formed, coldworked and engraved glass, 85 x 85 x 8cm. Photo: David Paterson.

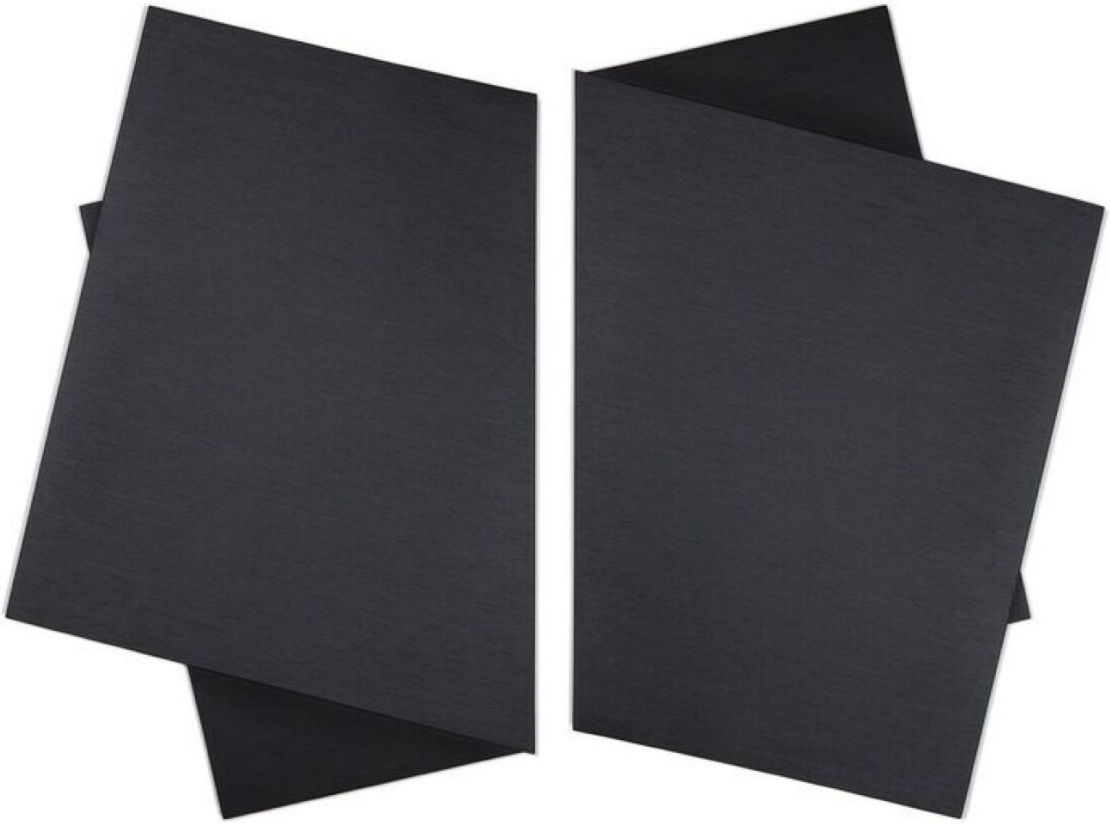


Fig. 6.13 Mel Douglas, *Two fold* 2018, from the series *Rendering*, kiln formed, coldworked and engraved glass, 2 @ 85 x 45 x 5cm. Photo: David Paterson.

These panels of folded glass became articulations of space through a change in rhythm. By incorporating the borders or edges as lines, similar to the way Sandback treats edges, they became demarcations in space showing where to cross or where to turn back.

Highlighting

Highlighting is to emphasise or make prominent, and is an area of most intense light on a represented form. The series *Highlighting* employed the unique properties of glass—transparency, translucency and opacity—as a way of concealing and revealing space. Light and shadow created new volumetric windows and lines. The process of layering sheets of glass, developed what I have coined, 'light lines' which are lines of glass which move from the surface of the glass, into the substrate and out the other side. This section identifies how glass as a drawing material, and as a substrate for drawing, contributes new methods of drawing with light and shadow.

The series documented variations of colour and light, line and shadow and, in so doing, explored visual and spatial perception. Driven by a fascination with light and colour, the *Highlighting* series drew on mathematics, geometry and scientific studies of perception. Each panel in the work *Borderline* (2018) from the series *Highlighting* (Fig. 6.14) has an orb-like glow, giving the flat planes three-dimensional depth, alluding to a space beyond the surface. The cuts through the top surface reveal the underlying material. These cuts link drawing to ideas of rupture and disturbance, and locate this drawing and line making in negative spaces and voids.

I draw similarities between the notions of disruption in Lucio Fontana's *Spatial concepts*, discussed in Chapter 1, and my work *Borderline*. Fontana's ruptured canvas surfaces created a dialogue and interdependency between a sculptural surface, and a space beyond the surface. Like Fontana, *Borderline* used cuts and ruptures within the planes of the work, as a way of engaging with negative space. I also see these works as compressions of space. These works are constructed through multiple tonal shades of grey and white. By using the translucency of the material, I am able to create light void and shadows within the stacks. Once fired these works compress into single condensed volumes which allude to a space beyond or within.

Borderline exploits the unique characteristics glass has which allows ways of working between, in and through layers. By working with the transparency and translucency of glass, negative spaces can be created, or implied by using the material qualities of glass. Negative spaces or hollow spaces can be alluded to by contrasting translucent or transparent glass with more opaque areas.

Combining these different types of glass, new networks of moving lines are created through space of the objects. By changing the density or thickness of opaque glass, creating rupture lines in the surface and by layering light and dark coloured sheets into homogenous panels, I discovered new ways of compressing space, developing new modes of illusionary volume and, by using crack, cuts and creases, a means for drawing with light and shadow lines. (Fig. 6.15)

While working on *Borderline*, I became less interested in the revealed lines of light and more intrigued by the space illusions that began to appear within the works. Through the layering of clear and translucent shapes of glass and then using heat to form re-form the glass into a homogenous body, new pockets of space began to emerge. Bands of light started to appear on the surface and the back side of these works as they were exposed to light. I noticed the halos of light around the shadow of more opaque shape of glass. Looking more closely at the shadows and halos I could see concentric, successively dimmer rings. This optical phenomenon that was occurring was so intriguing, I had to investigate it further. It led to the work *Refracted)*(2018) from the series *Highlighting* (Fig. 6.16).

I found that the optical phenomenon was increased by the addition of mass to the front, and to the back of the panels, which were then flattened in a kiln to compress all of the elements together. Mesmerising, shifting concentric shadows started to dance across the surface. This series provided a newly voluminous way of working with line and space.

Transcribing

Transcribing is to convert a representation. This series delves into the possibilities of glass powder as a medium for silkscreen printing. Screening glass powder onto a kiln shelf and firing the drawing, what remains is a thin flexible form. The resulting flexible line drawings illustrate the potential, versatility and mobility of glass as a drawing material, transforming a hand-drawn sketch into a solid moveable and yet malleable three-dimensional object. It was by chance in 2016 that I was introduced to screen printing on glass by visiting artist, Jeffrey Sarminento. Sarmiento was in Canberra teaching a two-day class in the School of Art & Design's Glass Workshop. While I had experimented with various methods of printmaking, screening was one method I had not explored.

In the workshop I was introduced to two methods: screening glass enamel paints onto glass and screening glass powder (fine granulated glass) onto glass. As we started to print our images onto sheets of glass, I could immediately envisage the potential of these methods for my practice.

One thing I found very limiting, however, was the printing on glass as a substrate. The flat sheets of glass we were working on made the images look like decorative elements rather than an integral part of the artwork. The fire polished reflective surfaces made the images float on

top of the material. The glass became a heavy frame that made the images look like fragments, rather than considered images. I wanted to find another way of using glass as a printed image that was not attached to glass in this way.

As I pondered how I might go about this, Tim Ingold's question, 'For there to be lines, do there have to be surfaces, or can line exist without surfaces at all?'[66] swirled around in my head. I knew that for my satisfaction, these screened drawing needed to be removed from the glass, so I began my experimentation with screening my linear drawings, to see if they could exist without surfaces. After much experimentation I developed a system of making a line drawing on paper, which was then transferred onto a silkscreen. I then used glass powder as my medium, directly screening it onto a kiln shelf and firing it. The fired drawing became an independent line drawing that existed without a surface. (Figs. 6.17 and 6.18)

The flexible glass drawing provided a myriad of ways to develop three-dimensional line drawings. I was able to layer multiple veneers of line drawing, creating new low relief spaces. The interconnecting lines become a homogenous matrix holding and hovering the line drawing in three dimensions, a multi-dimensional matrix. By screening multiple images upon one another before firing, or by layering pre-fired images in multiple layers, I have constructed multiple layers of additive traces, that form new and complex spaces.

Detach (2018) (Fig. 6.19) illustrates printing an image, and overprinting that image, before firing—building multiple layers of glass power lines that knit themselves together, building new surface on top of the previous layer, building multiple layers of additive traces. The work was informed by Tapio Wirkkala iconic, *Leaf Platter*, which I discussed in Chapter 2. *Detach* was exhibited as part of an exhibition at The Corning Museum of Glass. Artists were given a work to respond to, and I responded to Wirkkala's *Leaf Platter* in glass. This exploration allowed me to explore the way interconnecting lines can bind forms and become the fabric of the object. This glass drawing pays homage to Wirkkala, whose practice transformed the way that I approached the connection between drawing and three-dimensional objects. I planned these pieces in layers like the act of printing itself, which is a process inherently similar to building a three-dimensional space, that fuses line and volume to form a multi-layered sculptural experience.

I experimented with how I ran the glass powder through the screens, exploring the expressive quality of line. I printed so that the drawings had even tempered, uniform thickness and tone value. This made the images and lines move with ease. I noticed as I worked that the slight changes in the angle of screen, the kiln shelf or the angle of my hand made changes in the line. I experimented with changing the tactile control, touch pressure and hand wrist changes

66 Ingold, *Lines: a brief history*, p42.

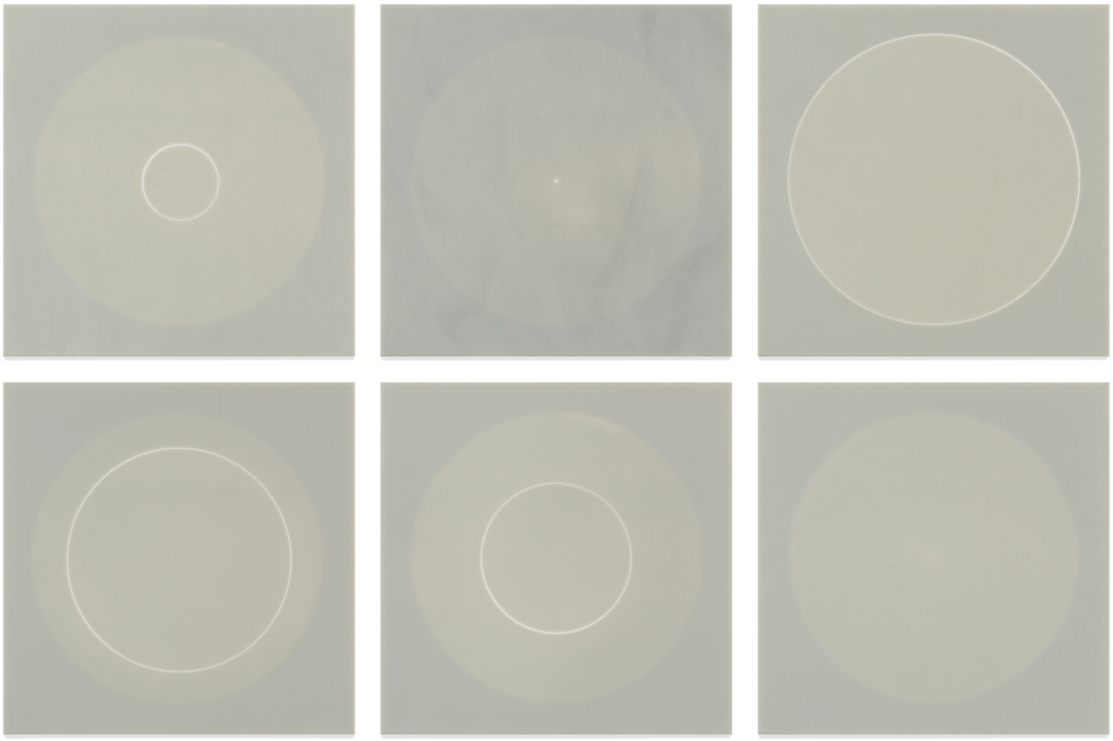


Fig. 6.14 Mel Douglas, *Borderline* 2018, from the series *Highlighting*, kiln formed, coldworked glass, 120 x 150cm. overall. Photo: David Paterson.

Fig. 6.15 Mel Douglas, *Studio exploration #21* 2016 (detail), kiln formed glass, 45 x 45cm.

Fig. 6.16 Mel Douglas, *Refracted* 2018, from the series *Highlighting*, kiln formed, coldworked glass, 50 x 150cm. overall. Photo: David Paterson.

when I printed. This developed changes in the thickness of the lines in areas, some of the lines started to bob, swell and move off the page.

Shudder (2018) from the series *Transcribing* (Fig. 6.21) extends this linear way of drawing using a grid structure to build a multi-dimensional surface. The lines cross and connect into a web, building new layers of surface, which overlay and entangle into interconnected spaces. The traces resemble woven tapestries, the lines weaving in and out of one another, building on top of one another to create a surface. I came to understand these works as compressions of space too, reducing three-dimensional objects into a two-dimensional space, compressing and condensing space.

I see connections in *Shudder* to the way Hefuna moves space backward into the picture plane, rather than forward with the use of translucent veiling. In my work, I combined and layered two drawings, one black and one translucent white. This was reminiscent of the pages of Hefuna's tracing paper. By analysing how Hefuna was able to make her work recede by slowly fading the background out, rather than building up the foreground, I used a combination of tones of lines, contrasting the opalescent glass behind the black, allowing the black object to float on the surface while the opaque pushes back into the substrate. By following the methods of pictorial rendering in space, I was able to get the black image to pull the opaline back into space with it.

The *Transcribing* series demonstrated that line can exist without a substrate and clearly identifies that threads can build new surfaces. Although I experimented widely, there is a clear path forward for future development of these ideas. I can see so many possibilities and new spaces to investigate.

My next task will be to get to a place where these objects can exist beyond or independently of a substrate. One of the most compelling aspects of these drawing is their flexibility, it emphasises one of the unique and less well-known attributes of glass as a material.

Tracing

Tracing: to follow a course, draw a line, make an outline of something, to ponder or investigate, to look follow or pursue. To trace is to delineate, score, devise, plan out and to pull.[67]

Tracing is a series of drawings made from hand-pulled glass threads. This method of drawing with glass was one of the most distinctive ways of using glass as a drawing material. *Netting*

67 *Oxford Dictionaries*. 'Trace' (n.)," definition for silence, URL: http://www.oxforddictionaries.com/definition/english/trace (accessed 1/7/2016). Now available at: https://www.lexico.com/en/definition/trace

(2018) from the series *Tracing* (Fig.6.22) and *Tracing* (2018) from the series *Tracing* (Fig.6.23) both use line as thread to explore the relationship of line, surface and space. They both map

the body's trace in space. The linear threads reveal how line can become a physical presence or absence in a space, and exist detached from the plane. These drawings exist in real space and move between two and three dimensions.

The *Tracing* drawings were constructed by melting sheets of glass into a liquid molten state, and stretching the glass into hot malleable threads that freeze almost instantly into a fixed record of time, gesture and movement. These line drawings illustrate the ability of glass lines to shape, have tonal variation, depth and volume. As glass is an amorphous material which gradually changes viscosity depending on temperature, a line of molten glass can be drawn out freely into the space and immediately sets in the drawn form. This property of glass offers so many ways to manipulate and use it as a drawn-out line.

As I began working on this series, I could see the connection to earlier works I have referenced, such as Richard Long's, *A line made from walking* (1967) (Fig.6.24). Through the act of walking through a field, he bent blades of grass which tracked his movement. I noticed that, unlike Long's tracks which were consistent and at a steady pace, my line monitored an action that started in a hurried flurry of confusion, made evident in the weight and quality of my lines.

My tracings began rushed, with a few stops and starts, as I tried to get into a rhythm with the flow of the material. The linear threads were uneven, short and varied. As I became immersed in the process and relaxed, the strands started to develop into a consistent rhythmic line. When relaxed the movement of the line is fluid and consistent. The glass lines traced my bodily movements, developing into a drawing that is essentially a connection between myself and material. Applying embodied knowledge, I was able to lose myself in the act of making.

Scribing (2018) from the series *Tracing* (Fig.6.25) is a nest of glass threads bound together to suggest space, tactility, movement and energy. The lines trace and record my activity, routine and document time. Through the observation of how the lines overlap and weave in this work I came to consider the act of drawing as an open-ended activity. Drawing starts with a line that unfolds, it moves and continues indefinitely into space. As you begin to make a drawing, a mark becomes a line, line becomes contour, and contour becomes an image or a field.

These works explore space and create new surfaces in three dimensions. They exist independently, without a substrate. The lines are interconnected matrices of glass threads that cast shadow lines. While the threads themselves give the drawing a sense of stability (they are tangible and occupy space), the shadows are an important element, as is the space between and around the glass threads.

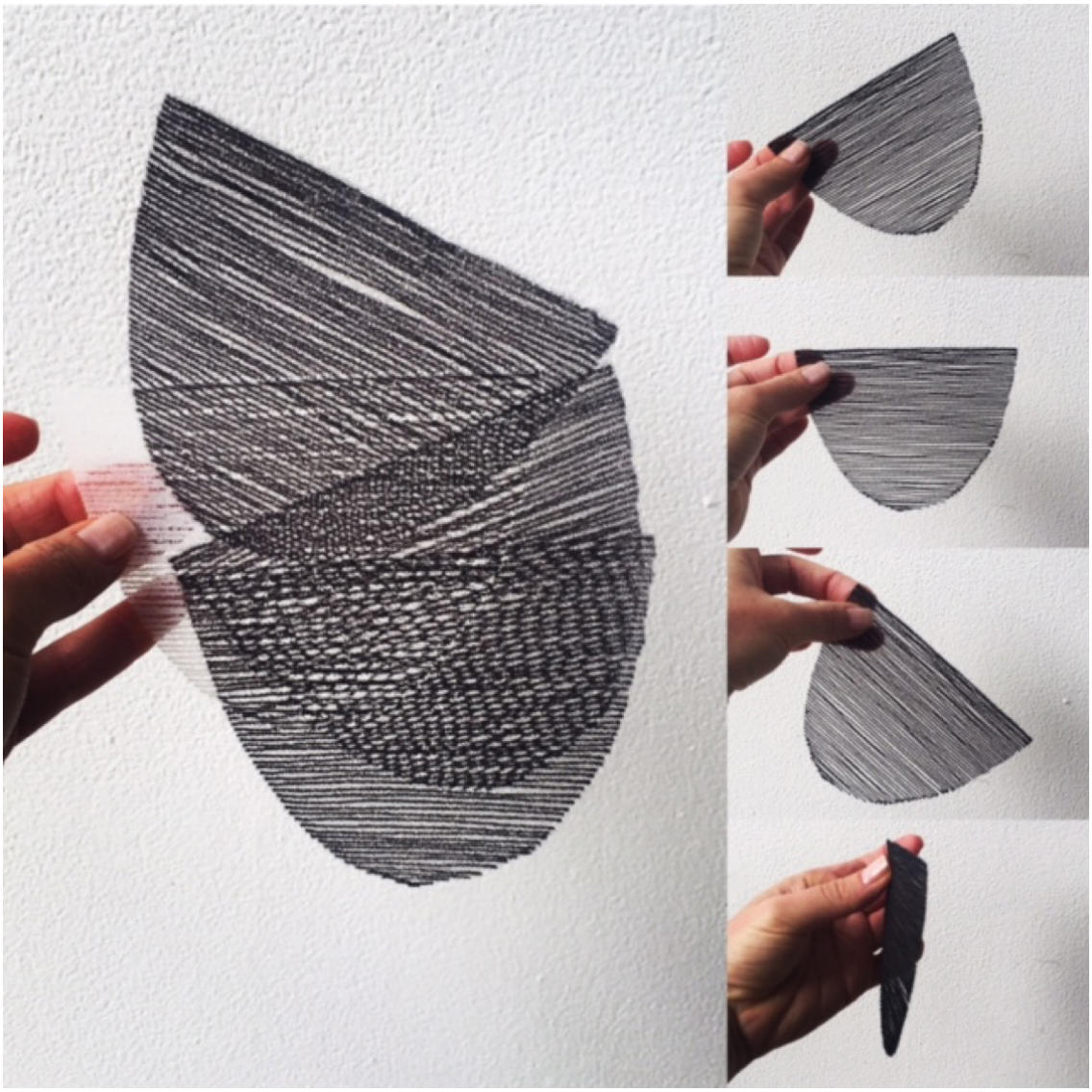


Fig. 6.17 Mel Douglas, *Studio exploration #22* 2017, glass, 20 x 10cm.

Fig. 6.18 Mel Douglas, Working image *Studio exploration #23* 2017, glass. Photo: Louis Grant.

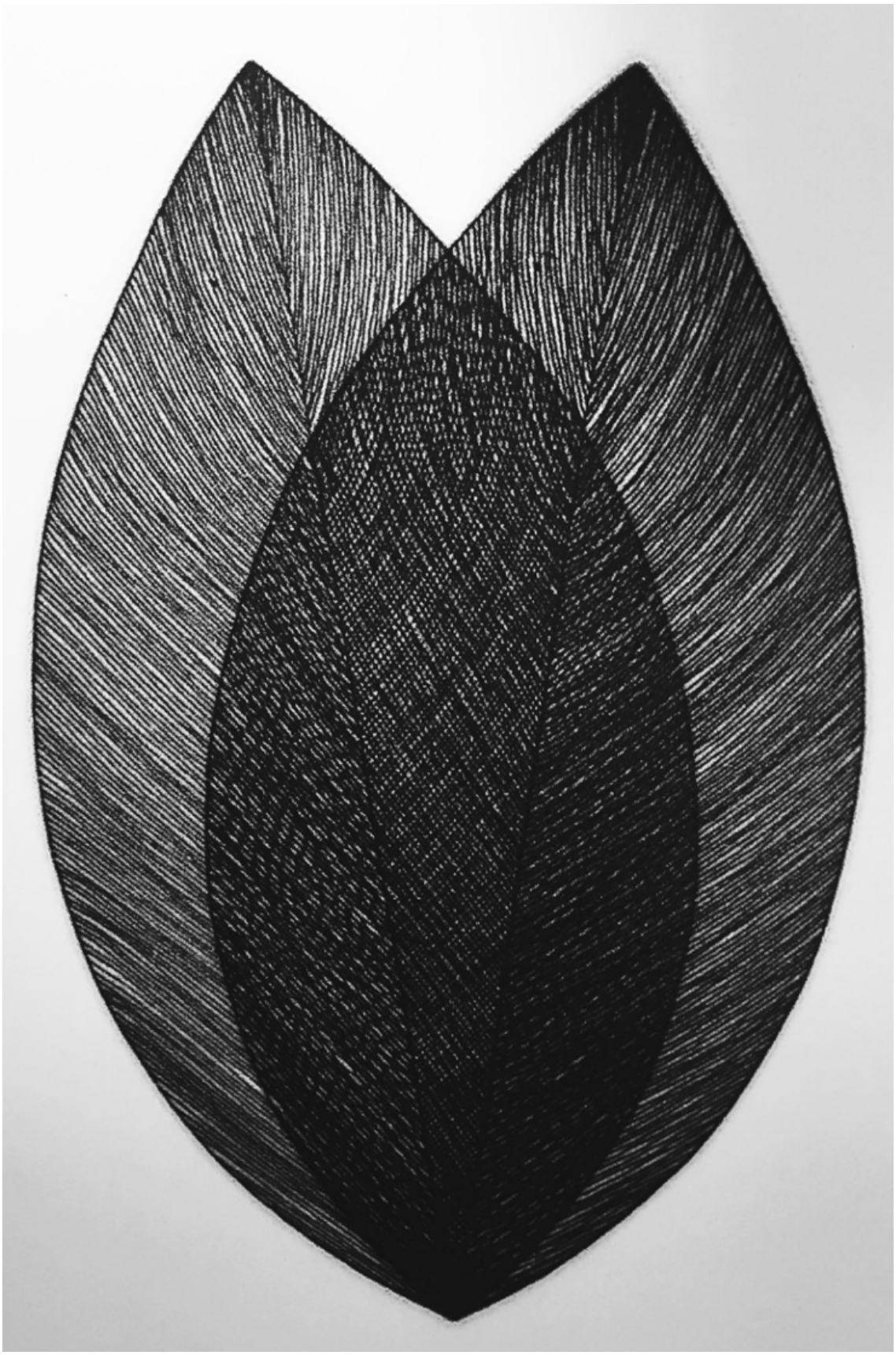
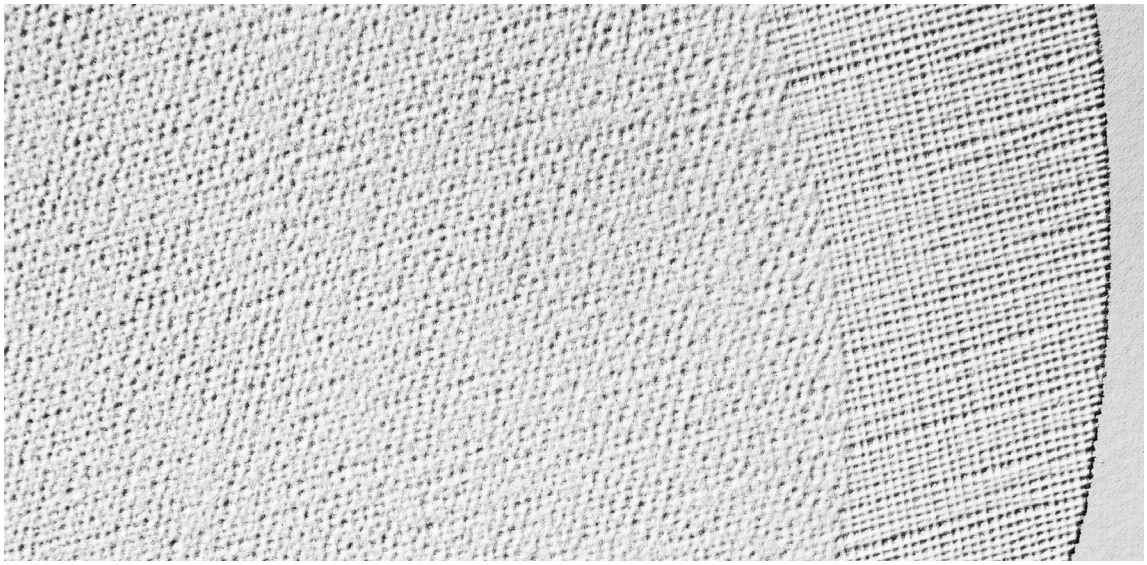


Fig. 6.19 Mel Douglas, *Detach* 2018, from the series *Transcribing*, glass on paper, 55 x 65cm. Photo: David Paterson.



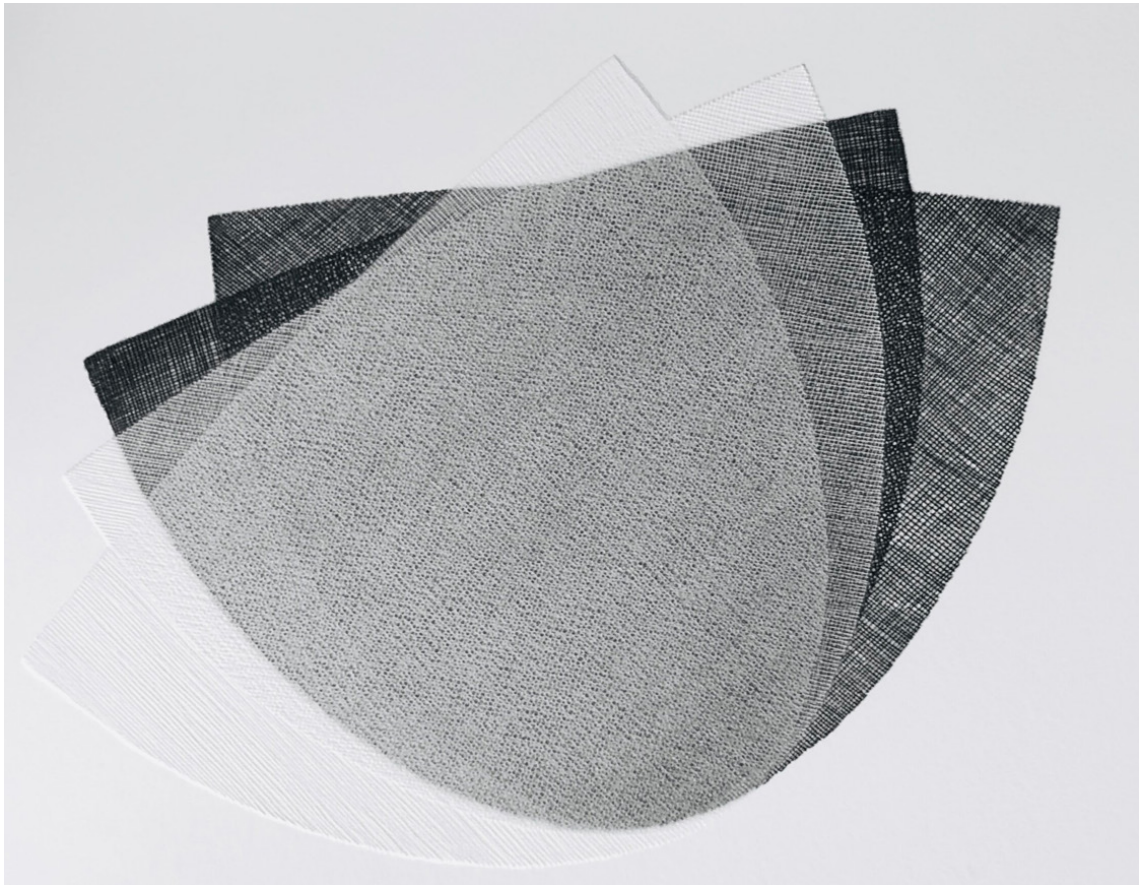


Fig. 6.20 Mel Douglas, *Tipping* 2018 (detail) from the series *Transcribing*, glass on paper, 45 x 45cm. Photo: David Paterson.

Fig. 6.21 Mel Douglas, *Shudder* 2019, from the series *Transcribing*, glass on paper, 55 x 65cm. Photo: David Paterson.

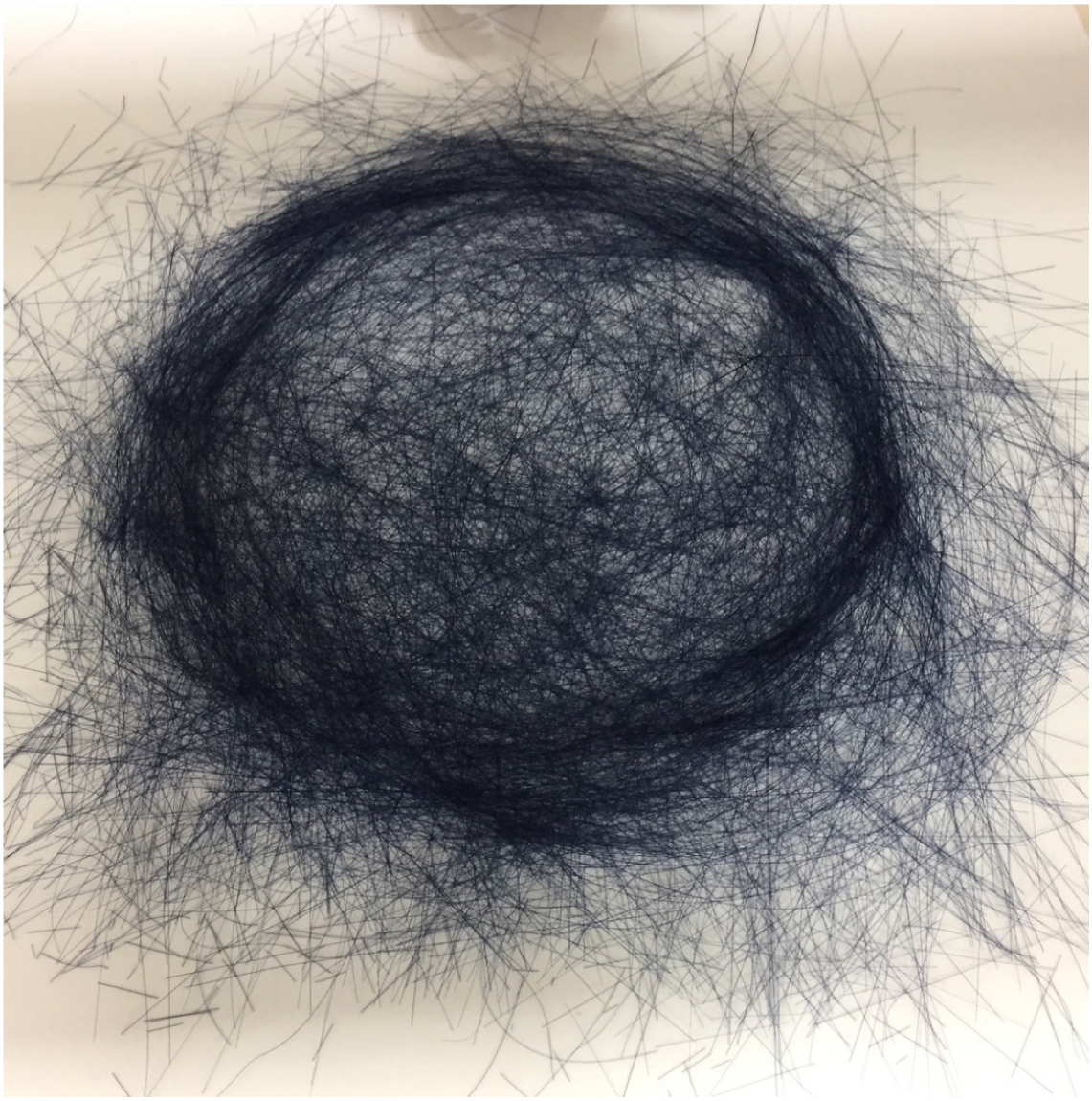


Fig. 6.22 Mel Douglas, *Netting* 2018, from the series *Tracing*, glass line drawing, dimensions variable.

The connection between LeWitt's wall drawings and the way tonal variations and shifts started to build through repetitive layers of lines started to become apparent as this series progressed. Through the physical action of pulling these threads, changes in volume started to develop, giving the nest volume through tonal changes in the line. The denser the areas of line the more the piece moved into the foreground, echoing the way LeWitt's wall drawings move into space. *Scribing* used linear threads to build space independent of other materials or a substrate.

Another intriguing aspect of these drawing is the reflective nature of the surface of the lines themselves. The threads are extruded from the kiln as shiny fire polished lines. Because they have a reflective surface, the space around the room is drawn into the drawing itself. Areas of the environment are reflected and refracted in the work. This also makes the works look airy and light, almost like they are floating in space. Of this effect Bourgeois noted:

> Drawings have a feather like quality. Sometimes you think of something and it is so light, so slight, that you don't have time to make a note in your diary. Everything is fleeting, but your drawing is a reminder: otherwise it is forgotten.[68]

A study of Bourgeois' work steered me to question the significance of these drawing as completed and kept works of art. The joy in these works is in the making. It is turning chaos into an ordered, rhythmic and gestural drawing. It is the ability to let go of what your mind and body is telling you to do and to become in tune with the material. These works are fleeting moments, which capture an immersive experience. It was tempting to see the experience as a visual representation. When I commenced this series, I contemplated how they could become more permanent. Through the process of trying to translate or transform these drawings, they lost their potency, they lost their volume and the glass strands lost their plasticity and movement. This series is still in the early stages of development, there are many different paths I can pursue, and I look forward to seeing where the insights leads.

In this chapter I have demonstrated how I used the materiality of glass in relation to the characteristics of drawing, geometry and architecture and how these ideas sit in contrast to conventional approaches in studio glass. By describing the methodologies and processes of my research outcomes, I have shown how I have extended and challenged my existing studio practice, along with broadening the field of knowledge framing contemporary studio glass.

The series *Mapping, Inscribing, Rendering, Highlighting, Transcribing* and *Tracing*, explored alternative techniques to draw with or on glass. Each of these categories used concepts of geometry, drawing, printmaking, glass and philosophy to support my investigation of how glass offers very specific ways to both conceptualise and realise the drawn line to explore space.

68 Louise Bourgeois and Lawrence Rinder, *Louise Bourgeois: Drawings & Observations*, 1995, Berkeley: University of California.

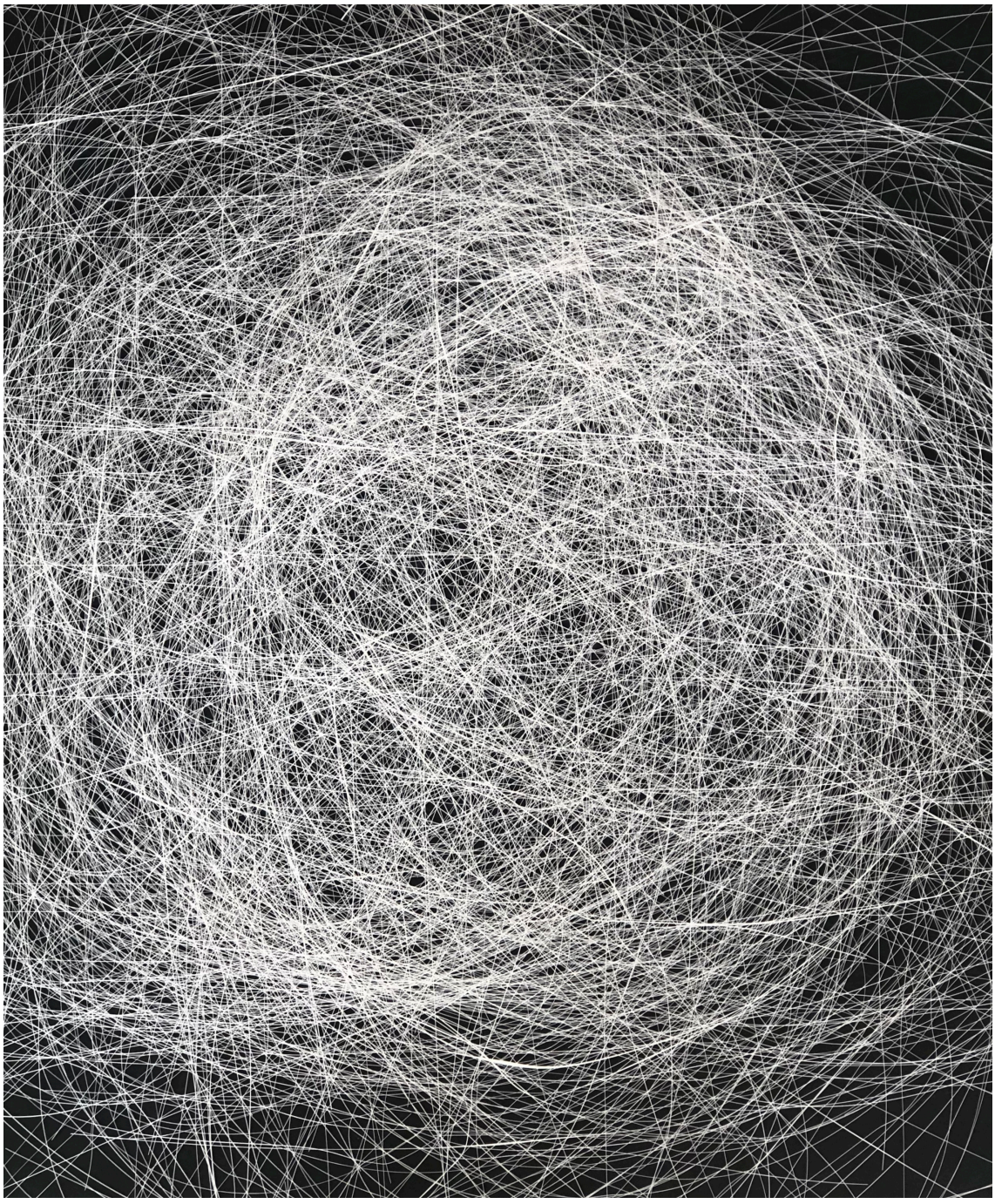


Fig. 6.23 Mel Douglas, *Tracing* 2018, from the series *Tracing*, glass line drawing, dimensions variable.

Fig. 6.24 Richard Long, *A line made by walking* 1967, silver gelatin print, 37.5 x 32.4 cm. Collection: TATE Gallery, London.

Fig. 6.25 Mel Douglas, *Scribing* 2019, from the series *Tracing*, glass line drawing, dimensions variable.

Conclusion

In my practice-led research *Surface Tension: Studio Glass and the Drawn Line*, I created a new body of work, questioning the ways in which the treatment of the surface of glass objects can be used to create a tension between the interior and exterior spaces. I used the concept of the drawn line as a connecting idea between three- and two-dimensional space. By creating drawings with glass, I considered the relationship between studio glass and drawing, and I concluded that the medium of glass offers very specific ways to both conceptualise and realise the drawn line. Taking anthropologist Tim Ingold's theorising on the nature of lines, my practice makes a case to extend Ingold's taxonomy to include categories of line only possible in glass.

My research addresses the research question of how glass might be used in distinctive ways to explore the relationship of line to three-dimensional space and surface, and found the following conclusions:

Firstly, I identified and classified the conventions of drawing in relation to object-based practice, specifically within the field of studio glass. I then noted key examples by artists from the late 20th century for whom drawing provided a lens through which to reconsider the formal and spatial qualities of my glass practice.

From this research I then explored the spatial implications of drawn line in relation to my three-dimensional art practice, specifically in relation to contemporary studio glass. I found that a drawn line can function to define or express an object or space and experimented with how this could be applied in relation to my practice in studio glass.

Finally, I stretched the limits of glass as a medium to create a drawn line as an object independent of a substrate.

In the first stages of my research I explored what lines are or could be, ie. what relationships existed between lines and surface. I studied Ingold's taxonomy of line, outlining each of his classifications. Each category was supported and illustrated with examples of contemporary art works, along with my own material investigations which explored the application and suitability of glass as a drawing material and noting my discoveries, limitations and challenges.

By developing a comparative classification between varying types of line, I was able to observe the unique qualities and possibilities of line-making with and on glass, and its relationship to surface to explore space. Through the interrogation and visualisation of lines, I have identified three additional categories of lines, which sit outside Ingold's taxonomy. These new categories are: line as structure, line as space and light lines, adding new and exciting possibilities to both the field of contemporary studio glass and drawing. This supported my proposal that glass can be used in distinctive ways to explore the relationship of line to three-dimensional space and surface.

To situate my practice into the broader context of an interdisciplinary inquiry I considered specific works by the artists Maholy-Nagy, Susan Hefuna, Sol LeWitt and Fred Sandback. These artists used line as a way of moving through, connecting and subverting space. Analysing these works enabled me to draw out questions about my own practice, and how the unique properties of glass could provide new ways of moving line through surfaces and into space.

Building on the idea of line moving through space, I examined key texts by Wassily Kandinsky and Albert Flocon and Andre Barre. By using these resources I was able to employ specific concepts of perspective and geometry to move line between one, two and three dimensions within glass surfaces and substrates.

By testing how I could articulate these ideas of line, space and surface I was able to create several speculative artworks during my residency at the Bullseye Glass Factory which developed my own taxonomic system of categorisation. I identified six streams of linear, surface and space investigations: *Mapping, Inscribing, Rendering, Highlighting, Transcribing* and *Tracing*. Each of these groupings explored alternative techniques to draw with or on glass and produced six series of objects.

Within each of these categories I looked to concepts within geometry, drawing, printmaking, and philosophy to support my exploration. These techniques ranged from glass as a hot and molten liquid line, to glass as a powder medium for screen printing, in sheet form as a drawn plane or as a surface to carve into and trace upon.

In testing the key concepts of this research, I discovered several limitations of the material and technical characteristics of glass, and additional constraints were imposed by the capacity of the workshop, tools and studio equipment. However, these challenges often led me to reconsider my findings, and consider how these outcomes supported my central argument in context of my research questions.

While this research could only be explored within the parameters of my research question, it has revealed multiple new directions for further exploration. Two main areas of research I intend to explore further through my practice include using glass printing process inside bodies of glass, and suspending drawings in a three-dimensional space. This will have implications for the further development of 'light lines', using the exterior body of glass to either reveal of conceal the drawing through a three-dimensional surface.

My research found that the transformative material of glass can be a means for mark making to draw lines spatially. Glass is an amorphous material which gradually changes viscosity depending on temperature, therefore a line of molten glass can be drawn out freely into the space and immediately sets into a drawn form. It can hide and conceal line, it can cast shadow lines which move through and into the substrate. Glass as a means for exploring line spatially offers abundant and unique avenues.

This period of practice-led research *Surface Tension: Studio Glass and the Drawn Line* has allowed me to consider the materiality of glass in relation to the characteristics of drawing, and how these ideas sit in contrast to conventional approaches in studio glass. By describing the methodologies and processes of my research outcomes, I have shown how I have extended and challenged my existing studio practice, along with broadening the field of knowledge framing contemporary studio glass.

I have expanded the boundaries of what drawing in the context of studio glass are or could be, through a better understand the material—glass—and by pushing the limits to see where it crosses over with other materials and methods—drawing.

following pages 152–155
Installation views, *Mel Douglas: Higher Research Degree: Season 2*, 2019, School of Art and Design Gallery, Australian National University, Canberra, ACT, Australia

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Biography 2015–2019

Awards/Grants

2019 Finalist *Moje Glass Prize*, Canberra Glassworks, Canberra, ACT, Australia
Selected for the *New Glass Now* exhibition, Corning Museum of Glass, Corning, NY, USA
Inaugural acquisition for the Robert and Eugenie Bell Decorative Arts Fund, National Gallery of Australia, Canberra, ACT, Australia

2018 Finalist *Fuse Glass Prize*, Jam Factory Craft and Design Centre, Adelaide, SA, Australia
Finalist *Hindmarch Glass Prize*, Canberra Glassworks, Canberra, ACT, Australia

2016 Pilchuck Scholarship, Stanwood, WA, USA
Australian Government Higher Research Scholarship, Australia

2015 Arts ACT Quick Response Grant, Australia

Solo Exhibitions

2019 *Higher Research Degree: Season 2*, School of Art and Design Gallery, Australian National University, Canberra, ACT, Australia

2017 *liminal*, Sabbia Gallery, Sydney, NSW, Australia

Group Exhibitions

2019 *Art Miami*, represented by Heller Gallery, Miami, FL, USA
Design Canberra, Craft ACT: Craft and Design Centre, Canberra, ACT, Australia
SOFA Chicago, represented by Traver Gallery, Chicago, IL, USA
Salon Art and Design, represented by Heller Gallery, New York, NY, USA
Moje Glass Prize, Thors Hammer, Canberra, ACT, Australia
One, three seven, Beaver Galleries, Canberra, ACT, Australia
Avanti, Sabbia Gallery, Sydney, NSW, Australia
The Hot Shop: Masters of Glass, Sabbia Gallery, Sydney, NSW, Australia
New Glass Now, Corning Museum of Glass, Corning, NY, USA

2018 *Fuse Glass Prize*,Jam Factory Craft and Design Centre, Adelaide, SA, Australia
Hindmarch Glass Prize, Fitters Workshop, Canberra, ACT, Australia
Hindmarch Glass Prize, Toyama Museum of Glass, Toyama, Japan
Contour, Bullseye Resource Centre, Bay Area, California, USA

2017 *Object of Light*, China Academy of Art, Hangzhou, China
SOFA Chicago, represented by Traver Gallery, Navy Pier, Chicago, IL, USA
Sydney Contemporary, Carriageworks, Sydney, NSW, Australia
40th Anniversary exhibition, Traver Gallery, Seattle, WA, USA
Finalist *Hindmarch Glass Prize*, Fitters Workshop, Canberra ,ACT, Australia
Miniatures, Bilk Gallery, Canberra, ACT, Australia

Reflections, Craft ACT: Craft and Design Centre, Canberra, ACT, Australia

Reflections, Beaver Galleries, Canberra, ACT, Australia

2016 *Fuse Glass Prize*, Jam Factory Craft and Design Centre, Adelaide, SA, Australia

Hindmarsh Prize, Canberra Glassworks, Canberra, ACT, Australia

Reflections, Australian Parliament House, Canberra, ACT, Australia

SOFA Chicago, represented by Traver Gallery, Chicago, IL, USA

2015 *SOFA Chicago*, represented by Traver Gallery, Chicago, IL, USA

Beijing Design Week, National Exhibition Centre, Chaoyang Qu, Beijing, China

ANU Drawing Exhibition, School of Art and Design Project Space, Australian National University, Australia

New Contemporary Art and Design, Corning Museum of Glass, Corning, NY, USA

Palette: Masters of Glass, Sabbia Gallery, Sydney, NSW, Australia

Ausglass Members Exhibition, Worth Gallery, Adelaide, SA, Australia

Art, Architecture and Design in Glass, Jam Factory Craft and Design Centre, Adelaide, SA, and 12 Australian venues

Professional Teaching Experience

2009–19 Sessional Lecturer, Glass Workshop, School of Art and Design Australian National University, ACT, Australia

2018 *Linearity*, workshop, Corning Museum of Glass, Corning, NY, USA

2017 *Defining Line*, co-taught with Nancy Callan, Pilchuck Glass School, Stanwood, WA, USA

Presenter (poster) at the Glass Arts Society Conference, Murano, Italy

2016 *Point.line.plane*, workshop, Corning Museum of Glass, Corning, NY, USA

2015 Visiting artist and lecturer, San Bernardino University, San Bernardino, CA, USA

Presenter at the Glass Arts Society Conference, *Surface Tension*, San Jose, CA, USA

Presenter at Ausglass Conference, *Mapping the surface*, Adelaide, SA, Australia

Educational Workshops

2019 *Walkscape*, Australian National University, ACT, Australia

2018 *Carving glass*, with Mateo Suguso, Canberra Glassworks, ACT, Australia

2017 Drawing, with Dr Alison Monro, School of Art and Design, Australian National University, ACT, Australia

Jewellery and Object, Bilk Gallery, Queanbeyan, NSW, Australia

2016 Glass image making, with Jeffrey Sarmiento, School of Art and Design, Australian National University, ACT, Australia

*Jewellery and Objec*t, Bilk Gallery, Queanbeyan, NSW, Australia

2015 *Jewellery and Object*, Bilk Gallery, Queanbeyan, NSW, Australia

Residencies

2019 Chrysler Museum of Art, Glass Studio, Norfolk, VA, USA

2016 Bullseye Glass, Portland, OR, USA